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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

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TOM DALE, Editor

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OUR SOIL ★ OUR STRENGTH

URBANIZATION IN OHIO.—Of the total area of 26 million acres in Ohio, about 15.5 million acres have been classified as cultivable land. Previous to 1942, about 2.5 million acres of cultivable land had been converted to other uses. Since 1942, nearly 1 million acres of the cultivable land have been withdrawn from agricultural use—about 675,000 acres for urban and suburban homes, commercial and industrial sites, and other private developments, and about 320,000 acres for highways, airports, parks, and other public developments.

Every new home, factory, street, highway, airport, and shopping center permanently subtracts the land so used from the remaining agricultural total. The new homes will produce children, but not the food to feed them. The new factories call for products from the land at the same time they are using up the source of production.

—T. C. Kennard

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Aerial view of farms and wooded hills in southwestern Wisconsin.

—Photo by Erwin Cole

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All The Trimmings

A South Dakota Farmer Finds It Necessary to Use 15 Different Conservation Practices Plus Community Watershed Protection Program to Solve His Problems

By LLOYD M. HAISCH

"IT takes almost all the conservation practices in the book to provide my farm with complete protection from erosion," declares Oliver "Bob" Anderson of Lincoln County, S. Dak.

Mr. Anderson started being a soil conservationist when he was a young man on Meadow Lawn Farm with his father, Herb Anderson. That was in 1939 when a CCC camp at Alcester interested the Andersons in erosion-control measures. Now, Bob has one of the most complete soil conservation programs in southeastern South Dakota. Early progress was slow, but the efforts were persistent.

In 1941, when the Lincoln Soil Conservation District was organized, Bob Anderson, along with his father, made application to the district for assistance on their 240-acre unit. It was after a heavy rain in June when Bob, looked disapprovingly at his cornfield with rows running up and downhill, made the decision. Bob said, "It just made me sick, the way the field had washed, and I told Dad we just couldn't farm it that way any more."

Technicians of the Soil Conservation Service made a soil capability map of the farm. Then the Andersons and the conservationist started making plans for this farm unit that had lost much of its natural fertility. Soon thereafter, the elder Anderson retired and Bob took over complete management of Meadow Lawn.

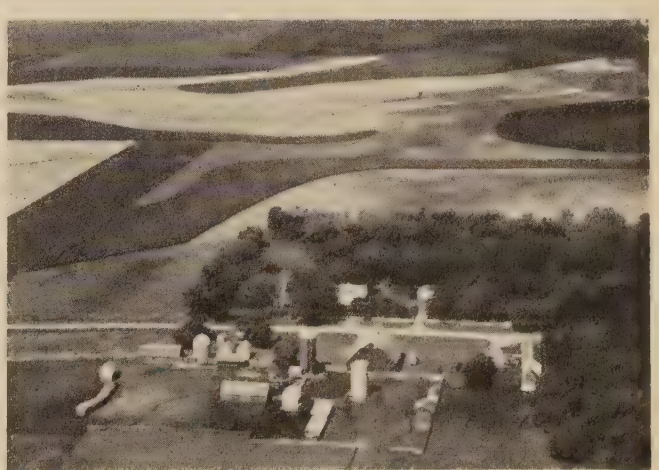
The conservation plan started with one important soil conserving practice and grew through the years until now it includes 15 different practices. The establishment of these measures, to reduce runoff and maintain fertility, did not come about as easily as one might think. It takes time to get a conservation plan as extensive as Bob's into operation. The driving force was the desire to provide his wife and three children with a good home and a respectable living.

After a good rotation was planned for the farm, Anderson was anxious to stop the erosion on the steeper fields. The practice of contour farming, he felt, was the first step to take and so a system of contour lines was laid out by the SCS technicians. At times, Bob says, he felt that results probably weren't worth the efforts, as he started on this "new way" of farming.

The contouring gave good results, but Bob was not satisfied. So, a contour stripcropping system was put into operation.

While the pattern of farming was being changed on the cropland, other plans were being made for the grass and woodland on the farm. The pasture, which was on flat land that flooded often, was in need of a dependable stock water supply. This was provided by a dam constructed in a waterway coming from an adjacent farm.

Besides providing this pasture with water, Mr. Anderson watched his grazing more closely and rotated with another pasture on a rented farm. This gave more pounds of beef per acre, as he "took half and left half of the grass" and the plants recovered quickly as commercial fertilizer was used to still further improve the grass.



Aerial view of the Anderson farmstead and some of the fields of Meadow Lawn Farm.

Note:—The author is work unit conservationist, Soil Conservation Service, Canton, S. Dak.

Contour stripcrops of grasses, legumes, and corn on the Anderson farm.

Stock water was needed in a pasture on an adjoining farm used to complete the rotation grazing program. A dugout was constructed with a dragline. The site had a high water table and ground water was hit at 7 feet. This gave a dependable water supply of about 5 feet, and under normal moisture conditions will provide from 9 to 10 feet of water.

Livestock is an important part of Mr. Anderson's soil conservation program. Bob says, "You can't have a good conservation program in this part of South Dakota unless you have livestock, too."

Many farmers wonder what Bob does with all the grass that he grows in his rotations. He usually has about one-third of his cropland in legumes and grasses. Grass silage provides this conservation farmer with just the outlet he needs for this crop. He has one silo for grass and another for corn silage. In the feeding of from 50 to 200 head of cattle, this makes for cheap feed and more profitable gains. Besides the grass from the cropland fields, there are several acres of waterways, headlands, and buffer areas that provide hay for silage. They also provide cover and nesting areas for upland game. These areas usually are not mowed until after the pheasant-nesting season.

Some of the waterways were so deep when he started his conservation program that they could not be crossed with farm machinery. These were graded and seeded to bromegrass and alfalfa. Now they provide "super highways" for excess water that drains from the terraces after heavy gully washers.

Yes, Bob also has terraces because he found that even contour strips would not reduce the runoff and erosion as much as he wanted. So, he constructed terraces after farming on the contour for 10 years. "That water and soil can't get very far away from my farm now," was his answer after the first terraces were completed.

The terraces used by Mr. Anderson are the narrow-base type that are not farmed. He seeds his terraces to brome and leaves them in permanent grass. Bob says he loses about three rows of corn, but doesn't have to farm the terraces and they make an ideal wildlife area. In the fall, when the stubble or stalks are grazed the grass on the terraces makes good feed for his cattle.

One might think that this surely would complete the conservation program; but, not on Meadow Lawn Farm. The windbreak that protected the buildings and yards was improved by shrub and conifer plantings. The protection from snow and wind is excellent and this, too, provides wonderful wildlife protection since the planting is 150 feet wide in places.

Anderson returns all the manure to his fields and plows under green manure, stubble, straw, and stalks. This has improved the organic matter and water-holding capacity of his soil a great deal.

Bob Anderson is a member of the board of supervisors of the Lincoln Soil Conservation District, so he came to learn about the watershed developments that are taking place over the Nation. In fact, Brule Creek watershed, in

which his farm is located, is now being studied by SCS technicians. It was through the efforts of Bob and his neighbors that an application for assistance on a watershed protection plan for this creek was made.

Why was a watershed program necessary when all the other practices were established? Anderson and his neighbors found they couldn't get a complete conservation program installed in their community without the cooperation of all the farmers in the area. For example, Bob Anderson's flat bottom land pasture would be the best land on his farm if he could keep the creek from spilling over its banks. It isn't safe to farm at present. However, with a watershed plan in which all the neighbors reduce runoff on their farms, and detention reservoirs constructed, many changes could be made. With this program in operation, the bottom land can be farmed and a larger part of the steeper land placed in permanent grass.

The soils map that Mr. Anderson started with suggested this change in land use. However, the flooding problem could not be solved except through group action. Some day, before Bob Anderson, Jr. takes over the farm, Bob hopes this change in land use can be made with safety.

What has all this effort cost this good farmer, and what has been his reward? The reward has been at least two-fold. In the first place, Anderson has received a great deal of satisfaction from doing everything he knows how to do, to reduce to a minimum soil and water losses on his farm. The material reward has been an increase in yields, which has meant greater profits.

Bob Anderson chopping freshly cut grass and legume crop for silage.

Les Harding, TV commentator, interviews Bob Anderson for a live TV show while Bob Jr. looks on.

In yield tests made by the county agent on corn for a 4-year period, the average yield on Anderson's farm was about 70 bushels per acre. For the same 4 years on other farms in the area, where the slope, soil type, and rainfall were almost identical, the yields were about 40 bushels per acre. This increase of about 75 percent pays good returns for the effort expended for farming the conservation way. This, to Bob, is positive proof that conservation pays. He says, "The results are beyond conception of the improvement I expected to get from this program."

These achievements have brought several recognitions to Mr. Anderson over the past 5 or 6 years. In 1953, Bob was selected as the outstanding conservationist in southeastern South Dakota. He was given an all-expense paid conservation short course at Iowa State College by the Mississippi Valley Association.

Two years before that, he received a similar award as an outstanding conservationist in the Lincoln district and was given an all-expense paid conservation short course at South Dakota State College.

In additon to practicing complete conservation on his own farm, Mr. Anderson has helped his neighbors get into a conservation program. The TV station at Sioux Falls produced a TV show on Bob's farm to help bring this story on soil conservation to the people of South Dakota.

Hills, Hogs, and Conservation

A Young Ohio Farmer Makes a Profitable Hog Farm Out of 82 Hilly Acres.

By M. E. FAIRALL

LOWELL AKEY lived on a hilly 82-acre farm near Zanesfield, Ohio. The farm just could not produce the income he needed for his family.

Lowell's neighbors had solved this problem by taking jobs in the factories in town. But he didn't want to be tied down to a machine. He had a rural background—his father and brothers were farmers—and he wanted to farm.

By 1947, Akey decided he had to make a choice—work in town or specialize in a farm program that would make a decent income. It could be done, he was sure, on the small farm he owned. After all, the truck farmer produced enough on a few acres to provide for his family. But, these 82 acres were not fertile enough and the erosion hazard was too great to think of crop production, so why not intensify hog production?

Note:—The author is work unit conservationist, Soil Conservation Service, Urbana, Ohio.

"I decided to specialize in hog production," Lowell recalls. "Hogs have always been one of the most profitable livestock enterprises, and are one of the most efficient of all farm animals in converting feed into meat. My past experience on the home farm was with hogs. This place would have made a dairy farm, but, I thought of the cost of remodeling the barn for a grade A dairy. Equipment comes high; so do dairy cows. I needed income quick. I couldn't buy heifers and wait for them to come into production. Besides, I was not cut out to milk cows."

Lowell weighed and evaluated all these things as he was making his decision. Once he decided to go into the hog business he had to face a hard fact: These rolling acres would never produce even a small part of the grain it would take for the number of hogs he would need to produce a decent living. So, his first decision

Farrowing sheds and feed lots on the Lowell Akey farm.

was to buy all the grain needed in feeding the hogs.

Since the prenatal period is one of the most important periods in the life of a profitable market hog, legume pasture for the sows was needed to keep them in prime condition. Hence, he built his cropping program around a top-notch rotation pasture system.

"I built the farrowing house, and the feed platforms by myself," Akey said. "Notice this farrowing pen? One-half of the floor area slopes toward the middle aisle fence. A sow always lays down to farrow with her back up the hill. The new pigs can crawl downhill under this guard rail. Hot water pipes are buried under the floor. There is a lot of difference between warm and cold concrete in saving newborn pigs."

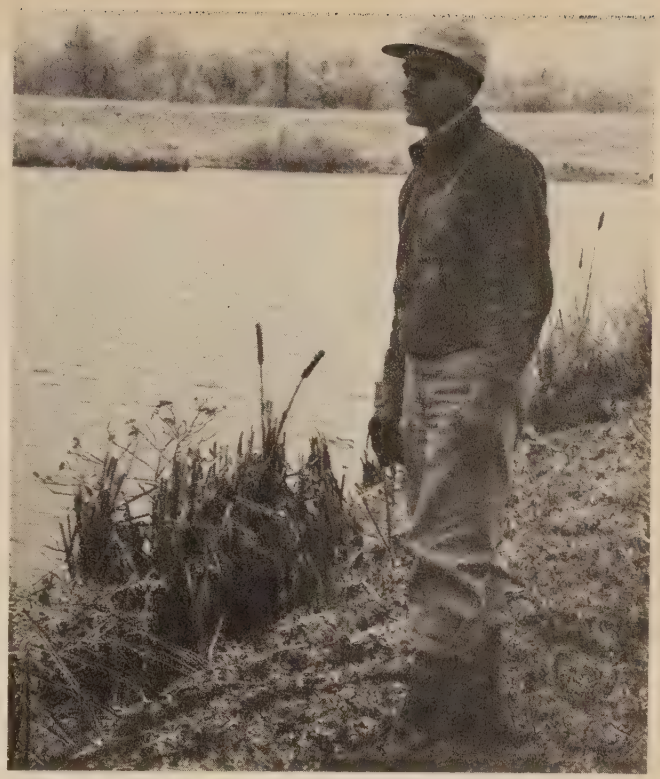
"There still was a problem I hadn't solved," Akey continued. "The well on the farm didn't produce enough water for the house. A new well didn't hold much promise in our terrain. Early in my planning, I outlined my problems to Walter H. Dove of the Soil Conservation Service. After looking the situation over he suggested a farm pond about 500 feet from the buildings. There was a good site there and it would be handy."

Lowell became a cooperator with the Logan County Soil Conservation District. SCS engineers designed a 3-acre pond. A local contractor with a bulldozer built an earthen dam of 1,500 cubic yards. Behind this dam there is clear water, 11 feet at the deepest. Around 10 million gallons of water can be drawn through the filter. Water is removed and electrically pumped to the automatic waterers in the farrowing house and the concrete feed lots.

The pond also supplies all the home water needs except for drinking and cooking. Mrs. Akey says she never could have had an automatic washer and bathroom without the farm pond.

"The kids and I certainly do enjoy having fishing and swimming right here at home. The thought of hooking one of those 2 pound bass, or a big blue, is incentive to hurry along with those evening chores."

The SCS farm planning technician divided the fields for a rotation of small grain and 2 years of hay or pasture. This provides plenty



Lowell Akey beside the 3-acre pond that furnishes water for his hog farm.

of clean legume pasture for the sows. During the winter, alfalfa meal is used to supplement the grain ration.

With a start of 30 brood sows in 1951 the enterprise has been built to 75 sows for 1957. Akey marketed 800 hogs in 1956, and plans to market 1,100 in 1957. All of the grain feed is purchased. He spends all his time caring for the hogs.

"The test of the enterprise is how much feed it takes to produce a pound of pork", Akey explained. "Last year's records showed it cost me 340 pounds of grain to make 100 pounds of pork, and that included the sows' feed.

"A fellow has to watch the markets too. I can't sell every hog I produce at the top figure. At the present time, my plan is to have the sows farrow in November, December, and January, then again in June, July, and August. This way I can keep away from the low markets and get some of the top prices."

Akey concluded: "I have the best success with sows fed on high quality legumes to keep them in prime condition. The number of pigs farrowed and their strength and vigor at

farrowing are reflected by the care and condition of the sow during gestation. The rotation pastures take care of that. To compete in pork production it is necessary to have the largest number of pigs per litter possible reach marketable age. That is why I am doing only one job and doing it to the best of my ability."

CHEAP FARM WATER

Many Farmers in Southwestern Virginia Are Developing Seeps and Springs for a Cheap, Dependable Water Supply.

By SHERMAN F. GOLD

IF you want to make what seems like a little water go a long way, develop a seep or spring. You can easily overlook seeps because they just ooze water. You'd never think one would produce enough water to be worthwhile. Yet, a trickle of only 3 pints a minute will keep a 500-gallon tank full. It will supply enough water for 30 cows daily. It's cheap too—usually cheaper than a pond—as many farmers in Virginia and nearby States are finding out.

Ralph G. Gunter can tell you about seep and spring development. As part of his soil conservation program, he built a pond on his 155-acre dairy farm near Abingdon, Va. It cost $1,300. The Agricultural Conservation Program (ACP) paid about 40 percent of the cost. But, the pond didn't fully solve the water problem for his 60 cows and 20 heifers. It was at one end of the farm. Often the cattle were at the other end. They walked off a lot of milk hoofing it back and forth for water.

Then, Gunter developed 2 seeps on his place. He built two 500-gallon concrete troughs or tanks. He put the troughs in fence rows. That way each serves 2 pastures. The seep development cost about $100 for each trough. ACP paid half.

Note:—The author is work unit conservationist, Soil Conservation Service, Abingdon, Va.

"The ACP people told me that dollar for dollar their seep or spring development investment brings the greatest returns," Gunter said. "It's a permanent investment, for one thing. It pays dividends year after year. I figure that on a dairy farm like mine, the increase in milk production will pay for the seep development in a year. With plenty of clean, fresh water handy, the cows really turn out the milk.

"I wouldn't part with my pond," Gunter says. "It has other uses. It's close to my home, dairy barn and other buildings. It's nice to know that it contains over 2 million gallons of water in case of fire. It gives the farm a pretty touch. It makes an attractive setting, especially when ducks are swimming on it. And we've stocked it for fishing. But for a cheap, dependable supply of water, nothing can beat a seep or spring development. Be sure, though, that the seep or spring flows the year around—doesn't dry up in droughts."

Even if they were as cheap, ponds won't always do in southwestern Virginia and surrounding areas. The soils are of shale, sandstone, and limestone origin. Often they don't hold water. Sometimes the ponds are slow in filling up, and may not stay full. In dry and windy weather the water evaporates fast.

Stock water tank supplied by a seep on the Ralph G. Gunter farm furnishes fresh water to two pastures.

A developed seep on the Lewis Bebber farm flows into the sealed tank in foreground. From there water is piped to the Bebber house and to the three stock water tanks in background, two of which are on adjacent farms.

This modern seep and spring development business started in southwestern Virginia only 2 years ago. Supervisor I. H. Huff of the Holston River Soil Conservation District wanted a stock water pond on his farm. But, technicians told him the site wasn't good for a pond. A rocky soil condition made it doubtful that the pond would hold water. And the capacity of the pond, because of a steep slope, would be too small to make the investment sound. The technicians advised developing a small spring they found on his place.

Huff discussed his problem with the other district supervisors. They voted to buy steel forms to make 500-gallon troughs. The district rents the forms to farmers for $7 per trough. Through the district one can also get ready-made concrete sediment boxes for $7.50 each. A farmer can develop the seep or spring himself or get the neighbors to help.

Gunter figures it takes three man-days per job. If you don't want to mix the concrete, you can get ready-mix. In some places, you can even buy ready-made concrete troughs.

SCS technicians have a standard formula for the job: Clean out the area around the seep or spring, and backfill it with a mixture of sand and gravel. Build a short concrete wall about 16 inches deep to keep the water from escaping below the gravel bed. Lay drain tile in the gravel bed to accumulate, filter, and lead the water to a sediment box. Any remaining sediment settles in the box. Run an underground pipe from the sediment box to the trough. The water entering the trough is clean and clear. Flow is by gravity.

A pipe takes overflow water away from the trough to a suitable outlet or to another trough down the slope. Water doesn't spill over. So, the livestock can't make a mudhole around the trough.

A lot of farmers get double use out of one little seep or spring that used to make only a messy wet spot. They make the one seep or spring supply two troughs. They get other benefits too; they can use the former water-logged areas. Sometimes that means as much as an extra half acre. Besides, there's no longer danger that livestock will trample the seep or spring. Trampling a spring or seep can make it change its course, reduce its flow, or dry it up altogether.

One small seep, near Lodi, Va., is watering cattle on three farms. In addition, it supplies the home needs of one of the farmers, Lewis Bebber. He used to haul household water from a store half a mile away!

Bebber fixed up the seep and piped the water into a sealed reservoir. From there he pumps water to his home. Overflow from the reservoir goes by gravity to a trough in one of his

Sediment box and stock water tank of a newly developed seep in a mountain pasture of the T. L. Hutton ranch.

pastures. The overflow from this trough goes to one on Mrs. Julia Mock's farm down the slope. And, from there the overflow is piped to a trough on John Sheffield's farm still lower down on the slope.

Judge T. L. Hutton's beef cattle put on more weight when they grazed high up in the mountains near Saltville, Va. But they lost the extra pounds and more, walking long ways for water. So, Judge Hutton developed a spring

Sealed tank on the J. F. Copenhaver farm supplies pure water to the grade A milking parlor. SCS technician, in background, checks sediment box.

at an elevation of 3,500 feet. Now, with water close by, the cattle will be able to hold their extra gains.

J. F. Copenhaver of Glade Springs developed a spring as part of his dairy operations. He pipes the water from a sealed concrete trough. The water reaches his grade A milking parlor clear and pure. County health officers said the new way was better than the old of getting the water from an exposed spring.

In 2 years, more than 50 farmers in Washington County alone have developed springs and seeps. The idea has spread to other Virginia districts and has jumped across the State line into Tennessee, where steel forms for concrete tanks are now being supplied to cooperators by soil conservation districts.

Small Farm Pays Off

By MARTIN HOWARD

TAKING the leap from tenant farmer to landowner can seem like a mighty long jump when you consider the big mortgage that will be staring you in the face for many years. That's the way Robert Cox, of Forsyth County, N. C., felt about it when he borrowed money through the Farmers Home Administration to buy a 63-acre farm in 1945. He admits he had many misgivings.

But, today Cox has done considerably better than make the grade. In fact, he is frequently cited in his local community as an outstanding example of a successful small farmer.

During the past 12 years, Cox has made a good living from the farm. He has put 2 children through high school, has modernized his small farm home, made needed repairs to outbuildings, and has completely mechanized his farming operations.

In the meantime, he has whittled down the mortgage to where it is all but paid off.

When Cox, his wife, and the 2 small children moved to the farm 12 years ago, some of the land was badly eroded. One of the first things he did was to work out a conservation plan for the farm with the Tri-Creek Soil Conservation District.

With the help of Tony Ernstes, Soil Conservation Service technician assigned to the district, he terraced and stripcropped all his cultivated land. He set up systematic rotations, limed and fertilized, seeded soil-building crops, and established sod waterways.

He also established improved pastures; and, more recently, has built a farm pond that he plans to use for irrigation. Payments from the Agricultural Conservation Program have helped in setting up approved practices.

But, the big payoff has been in improved production as a result of his conservation program: Wheat yields have increased in bushels per acre from 10 to 44; oats from 20 to 100; and corn from 15 to 85. Tobacco, his chief

Note:—The author is farm editor of the *Journal-Sentinel*, Winston-Salem, N. C.

Tobacco in contour strips on the Robert Cox farm.

crop, has jumped from 900 pounds per acre in 1945 to 2,400 pounds last year.

The increased moisture-holding capacity of his soil was indicated 3 years ago, when drought ruined many tobacco crops in the area. Cox reports that his average tobacco yield that year was 1,700 pounds per acre.

Plenty of fresh vegetables and canned goods for winter use is one of the family's strong points. They have several garden tracts enabling them to rotate the crops from year to year.

"A good garden saves buying many things," Cox says. "This is especially important for a small farmer, because he has to be a little more saving than a larger operator."

When tobacco allotments began to shrink several years ago, Cox added a flock of 100 laying hens to his farming operations. To offset another 20 percent cut in tobacco acreage this year, he plans to put in an extra batch of 100 chicks, "so our egg production will run the year around, not for just 6 months," he says.

Cox raises and fattens about 20 head of hogs each year. He also has 2 milk cows and soon will add a third. He hopes to add some income from the sale of milk. Ten acres of improved pasture on land seeded down early in his conservation program will help him carry out this plan.

Cox doesn't give all the credit for his success to soil and water conservation alone. Better seed varieties and better cultural methods have helped a lot, he says.

"I figure," he comments, "that these new methods are developed for farmers by our research men at the colleges and experiment stations, so why not make use of them after they're tested and passed on to us."

Modern machinery has helped Cox to keep up with the farm work, now that his son, William, is married and works on the farm only a part of the year.

His daughter, Viola, who finishes high school this year has twice won the district tobacco growing championship and was top-place winner for the western half of the State last year. She also has taken several top awards with her entries at livestock shows.

One gets the impression from this family's success, that a family-size farm can still be very much in the running, if the farmer keeps abreast of progress in soil and water conservation and improved farming methods.

Drainage of Irrigated Lands

A Report on the Drainage Problems in Irrigated Areas and the Improvements That Have Come About Both From Experience and Research.

By RONALD C. REEVE

No. 26

This is the twenty-sixth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

THE importance of drainage of farmlands has been recognized for thousands of years. Both open and closed drains were used by some ancient civilizations, at least, as early as 500 B. C. In this country, farmers have drained lands for agricultural use since the early days of settlement. But, most drainage operations were confined to wet lands in humid areas until recent years. Now, we are finding that drainage is fully as important on much of our irrigated land in western States as on the wet lands of the East.

Many of the drainage practices useful in humid areas have been successfully employed in draining irrigated lands. Because drainage in this country first began in the humid region, it is natural that methods and techniques developed under such conditions should serve as a guide for developing methods for draining irrigated lands. The fundamental principals of drainage apply in both humid and irrigated areas; but, there are many differences. These differences have required the development of new concepts and new drainage practices.

Perhaps the most important single thing that makes the drainage of irrigated lands unique is the salinity factor. Salts contained in soil, in ground water, and in irrigation water greatly change the requirements for adequate drainage. Salts are suspended in and move with water, accumulating at the soil surface when water is evaporated. Drains must not only be designed to discharge excess water, but also to discharge excess salts, thus preventing a buildup of salts in the crop-root zone.

Drainage of irrigated lands also differs from humid-area drainage because of man's control over the water that is supplied to crops. In humid regions, the farmer usually depends almost entirely on rainfall. Drainage systems must be designed to discharge untimely, and infrequent high-intensity rains, to control ground water tables under any and all conditions that might occur.

In irrigated areas there is control over the amount and frequency of water applications. Because of this, a farmer, either directly or indirectly, has control of most of the water that has to be drained. In fact, much of the difficulty in maintaining proper drainage conditions in irrigated soils is brought about by man himself. For example, seepage from canals, which can be prevented, adds to drainage problems. Inefficient irrigation practices, such as poor water distribution and excessive water application, also create problems.

Another difference that sets apart the drainage of irrigated soils from those in humid areas is the changing of surface topography in preparing lands for irrigation. Land leveling, or grading, is a common practice in preparing land for irrigation. It improves surface drainage by providing for better distribution of water, and tends to eliminate "low spots" or "seepage ways" where water collects and stands. Thus, land preparation generally improves drainage conditions and directly affects the extent and nature of the drainage systems required.

From the rather simple, perhaps crude, methods used by settlers in Colonial days, the "art" of drainage has gradually progressed toward becoming a "science." The early drainage work in this country consisted mostly of

Note:—The author is irrigation and drainage engineer, salinity laboratory, soil and water conservation research division, Agricultural Research Service, Riverside, Calif.

either constructing small open ditches to drain wet spots in fields, or of cleaning out small natural waterways. Little engineering work was involved.

The art of molding clay tiles and of installing them by hand on farms was brought over from Scotland in 1835. This was the beginning of modern tile drainage in the United States.

Through the years advances were made in the equipment, materials, and methods used, and in engineering principles governing both open and closed drains. Part of the advancement came about as experience was gained by farmers, contractors, and technicians, as more and more drainage systems were constructed. Then, too, organized drainage research has accounted for a substantial part of this advancement, especially in providing a better understanding of the principles involved.

Through research, improved techniques and equipment have been developed for studying drainage conditions. For example, a special type of groundwater observation well and a groundwater piezometer have been developed to determine water table levels and direction of ground water flow.

Jetting rig for installing piezometers. During installation, the depth of the lower end of the pipe may be read on the measuring tape.

Lysimeter installation for studying the effect of salts and water tables on crops, at the Salinity Laboratory, Riverside, Calif.

A jetting method of installing piezometers allows for logging of subsoil materials as the pipe is jetted. This makes it possible to install piezometers to much greater depths than by conventional driving methods. Small diameter pipe (⅜ inch) is used for this purpose. Piezometers of this diameter have been successfully installed and the soil logged to depths of 150 feet. This method and the equipment were developed in Coachella Valley, Calif., on a project conducted jointly by the University of California, the Bureau of Reclamation, the Coachella Valley County Water District, and the U. S. Salinity Laboratory. During the study, about 900 piezometers were installed to observe changes in the level of the ground water table since 1947.

Drainage research at the U. S. Salinity Laboratory has shown that, within limits, a high water table by itself is not necessarily detrimental to crops. In studies where the effects of both water tables and soil salinity on crop growth were investigated, the salinity of the soil was found to be by far the most important factor. In practice, if salt is not a factor, a shallow water table provides an effective way of supplying the required moisture for crop growth, as is the case in many humid regions.

In irrigated soils, however, the salinity factor must be taken into account. The detrimental effect of a shallow water table in irrigated areas, in most cases, comes primarily from the high salt content of the ground water and the rapid rate at which the soil becomes salinized

Installing tile drains in the Imperial Valley, Calif. Note sand piles that will be used for filter around tile.

when the water table rises near to the surface. In some cases, productive land has become completely unproductive in 3 months after the water table has come to within 24 or 30 inches of the ground surface. In general, where salt is a problem, the water table should be kept at least 4 to 4½ feet below the ground surface, and preferably to greater depths.

Field investigations are being conducted in at least 7 of the 17 Western States to develop better criteria for the design of drainage systems. These studies are conducted cooperatively by the Western Soil and Water Management Section, Agricultural Research Service, and the Agricultural Experiment Stations in the respective States. In many cases, the Soil Conservation Service and others are also participating. At Fort Collins, Colo., laboratory studies have been conducted in which a sand-filled tilting flume 2 feet wide by 72 feet long has been used to help answer some of the questions regarding the shape of the water table and the quantity of water discharged by interceptor drains.

Methods and equipment have been developed for installing tile drains in alluvial valley-fill soils that are common in many of the irrigated valleys of the West. Much of the pioneer work along this line has been done in the Imperial Valley, Calif. These developments have come through the efforts of private contractors working with both Federal and State agencies.

Open drains, which range from about 7 to 12 feet deep at approximately a ½-mile spacing, serve as outlet drains. Tile drains are used to drain individual farms. Individual fields are "bored out" by technicians of the Imperial Irrigation District and the Soil Conservation Service to locate the sand and clay layers in the profile.

On the basis of both research and experience in the area, a knowledge of the soil texture in the profile has been found sufficient to make determinations as to depth and spacing of drains.

Both clay and concrete tile are used in the Imperial Valley. Clay tiles are made in 1-foot sections with butt joints, whereas concrete tiles are 2 feet in length with tongue and groove joints. Clay tiles are mechanically pressed out while concrete tiles are generally made by the packer-head method to insure a high density concrete.

Tile laying equipment has been perfected to the point where the machine installs the tile at the appropriate depth and surrounds it with a sand filter of from 2 to 3 inches on all sides. The trench is usually backfilled with a bulldozer. As the tiling machine passes, the trench is supported by a steel shoe which follows behind the cutting wheel. The individual tiles are placed by a man who rides inside the shoe. Tiles are pushed into place with a hydraulic jack to insure positive contact and permanent alignment. The usual depth of tile drains is 7 to 7½ feet below ground surface. Feeder lines are 4 to 6 inches in diameter and collector lines 6 to 10 inches in diameter.

Tile drain outlet consisting of a 20-foot length of transite pipe, Coachella Valley, Calif.

Newly constructed open drain in the Coachella Valley, Calif. After the banks have drained and sloughed the ditch will be shaped to grade by a second pass of the dragline.

Many things have been learned as a result of experience in constructing open ditches and installing tile drains under the varied conditions encountered in the irrigated region of the West. For example, in areas where soils are unstable, due to inflowing water from a high water table, much caving and sloughing of banks may occur. Under these conditions, it is often impossible to dig a ditch to grade with the first cut. But, by allowing the banks and soil to drain after the first cut, a ditch can usually be dug to grade with a second pass of the dragline, though sometimes it may be necessary to redig a drain 4 or 5 times before final grade is reached.

Another simple, yet highly important, practice in tile drain installation is the use of a solid pipe for a distance of 15 or 20 feet from the outlet to connect with the regular tile which is in short sections. This prevents the undercutting and dropping of tile sections at the outlet end that otherwise might occur.

The importance of a sand filter around tile laid in alluvial soils has also been established. The elimination of maintenance difficulties due to filling of tile with silt and sediment more than compensates for the extra cost of providing a sand filter. In addition to its primary purpose of filtering out sand and sediment, there are also other advantages to a sand filter. It serves as a supporting base for laying the tile. Also, there is no need for leaving spaces between tile joints when a filter is used, because it has been found that tile sections can be pushed together tightly where a highly permeable material surrounds the tile. The irregularities between the matching tile ends allow enough open space for the water to enter.

Through years of experience, these and other developments, such as preventative measures for keeping tile drains free from roots and the exclusion of risers (observation boxes, air vents, etc.) from tile drains, have come about. Improved techniques in determining the best locations and the depth and spacing of tile drains have been developed through research coupled with years of testing.

Undoubtedly, drainage practices will continue to be improved as new materials and equipment become available and as our understanding of the principles involved expands.

The process by which drainage progresses from an "art" to a "science" may be accelerated by increased research effort. By coordination of effort on the part of contractors, farmers, researchers, and others concerned in advancing the knowledge in this important field, improvements, in the next 20 or 25 years, will add materially to the well-being of both farm and city dweller alike.

LIVING GRASS EXHIBIT ON OFFICE "LAWN".—The "lawn" in front of the Indian-American Valleys Soil Conservation District office at Quincy, Calif., serves as a demonstration plot for improvement of ranges, pastures, and meadows. One side of the "lawn" is planted to 24 different grasses and legumes adapted to the area; each is planted in an individual row 6 feet long. The other side demonstrates two recommended methods of seeding grass and legume mixtures. It also shows the effects of fertilization, since half the plot is fertilized while the other is not.

The demonstration has created a great deal of interest, not only among ranchers and farmers but also among businessmen and other citizens of Quincy. Furthermore, SCS technicians report that the living exhibit has done much to help get better pastures and ranges in the community.

—Roche D. Bush

THE NATIONAL INTEREST demands that the application of soil and water conservation be speeded up on the farms and ranches and on the watershed, grazing, and forest lands throughout the United States . . .

—Ezra Taft Benson
Secretary of Agriculture

The Spread of Pensacola Bahiagrass

By PAUL TABOR

MORE than 10 million pounds of Pensacola bahiagrass seed, produced during the past 17 years, can be traced back to 2 burlap bags of sprigs. The author dug the sprigs during the early part of May 1940, at Pensacola, Fla. They were washed free of dirt to avoid contamination with white-fringed beetles. After an official inspection and clearance, the sprigs were taken to the SCS nursery at Americus, Ga. and planted. This was the first known planting of this grass for seed production.

Before 1940, the county agent at Pensacola, E. H. Finlayson, had discovered this grass and had harvested some seed from naturalized stands. Local farmers had sowed some of it in pastures. Sometime later Mr. Finlayson began seed production on his farm, near the Georgia-Florida State line. It was he who proposed the name, Pensacola bahiagrass.

Fifty pounds of seed were harvested at Americus during the summer of 1940. A larger area was sowed at the nursery in 1941. Enough seed was produced for limited field distribution in 1942, while the acreage was expanded on the SCS nursery. During 1943 and the following 5 years, enough seed was produced and distributed from Americus to establish at least one 5-acre planting in each soil conservation district in the lower half of the Southeast. Seed was saved from many of these plantings and used to start additonal fields for seed production.

Normally, a new grass seed goes into a rod row at a nursery for initial study. If it is superior there, a larger planting on a more difficult site is made and studied. If the grass continues to be superior, it is ready for field-size plantings on farms of interested soil conservation district cooperators.

Pensacola bahiagrass was introduced and increased more rapidly than is normal. Naturalized stands at Pensacola were dense and productive on light, sandy soils. The plants were robust and started growth early in the spring. In the first plantings made on farms, Pensacola bahiagrass continued to perform well. These successes confirmed an early estimate that the new grass was valuable for soil and water conservation in the Coastal Plains of the Southeast.

The rapid expansion and distribution of Pensacola bahiagrass seed production would not have been possible except that the grass filled a real need. It grows a dense sod, is easily maintained, and is resistant to abuse. On land of average low fertility, it has been one of the most productive grasses. On the richest lands, however, other grasses surpass it in yield and quality.

The earliest history of the grass is not known. It was brought to Pensacola, probably in ship ballast, from southern Brazil, Uruguay, or Argentina. The sailing vessels, formerly in the lumber trade between the United States and South American countries, usually carried rock and dirt ballast when cargoes were light. Hence, the grass seed may have arrived in ballast and the grass became established near the city docks.

Pensacola bahiagrass seed crop almost ready for harvest.

Pensacola bahiagrass seed is eligible for certification in Georgia and may soon be eligible in other States of the Southeast. Part of the early established sod at the Americus nursery, now a plant materials center for the Southeast, is being used to produce registered seed.

Note:—The author is plant material specialist, Soil Conservation Service, Athens, Ga.

DISTRICT PROFILE

JOE B. DOUTHIT of SOUTH CAROLINA

THE name of Joe B. Douthit and Soil Conservation Districts are all but synonomous in South Carolina and in many other parts of the United States. Mr. Douthit has the distinction of being the oldest Soil Conservation District supervisor, in years of service, in the United States.

He says it all began on his farm near Pendleton, S. C., when he realized that his soil was being washed away faster than it was being rebuilt, and that the water that flowed off his land was needed by the crops on the land. He was instrumental in helping form the first Soil Conservation District in South Carolina, which was the second in the Nation.

He, with the late K. W. Marett, was appointed a district supervisor in August 1937. He has served continuously in that capacity, to date. He has served as chairman of the Upper Savannah Soil Conservation District for 15 years, as president of the State Association of Soil Conservation District supervisors in South Carolina for 5 years, and has just completed a 4-year term as chairman of the State Soil Conservation Committee. He was active in helping the late E. C. McArthur establish the State and later the national Associations of Soil Conservation Districts, and is currently a director of the National Association.

To visit the Douthit farm, is an inspiration to any person interested in the soil and products that come from it. He is a farmer who uses land and water but conserves both of these vital resources.

There are four ponds on the Douthit farm—some used for stock water, some for irrigation, and all used for fish production. On this farm one also finds terracing, crop rotations, strip rotations, orchards, vineyards, truck crops, and livestock. Here you will find the background of a farmer devoted to soil and water conservation and the "district" approach to these problems.

In addition to his work in the field of soil and water conservation, Joe Douthit has been recognized as a Master Farmer and has been awarded a Doctor's Degree in Agriculture by Clemson College, where he served as a Trustee for 20 years.

He was largely responsible for planning the Rural Ministers Conference which is held annually at Clemson in connection with Farmer's Week. This has helped acquaint ministers with rural problems. Also, he has served on the Town and Country Commission of the Methodist Church and was among the first to grasp the significance of teaching soil and water conservation in our schools.

Even before the extreme droughts of 1954 and 1955, Dr. Douthit was actively working toward a proposed water law for South Carolina. It was under his leadership that a study was begun in 1950 to draw up a proposed law. As a result of these studies and work, other southeastern States have since used this as a model in developing water laws for their states.

Joe B. Douthit.

Dr. Douthit has received many honors for his work in the field of soil and water conservation. He has been appointed an Honorary Member of the Soil Conservation Society of America and has been awarded a certificate for conservation farming by the Woodmen of the World.

In 1951, he was awarded a Balanced Farming Plaque by the Extension Service. That same year at the State Convention of the Future Farmers of America he was awarded an honorary degree as State Farmer. These honors have not just come—they have been earned by unselfish devotion to the cause of soil and water conservation, proper land use, and an interest in his fellowman.

—BRICE M. LATHAN

SAGEBRUSH CONTROL

Spraying Sagebrush on a Washington Range Results in a Three-fold Increase of Grass Forage.

By A. E. MILLER

SPRAYING sagebrush on the John Clerf range in the Kittitas Soil Conservation District, Ellensburg, Wash., has killed 95 percent of the sagebrush and increased grass production from 185 pounds to 780 pounds per acre. The treatment cost $4.00 per acre.

In 1954, with the help of Harry Wegeleben, range conservationist of the Soil Conservation Service, Mr. Clerf sprayed 20 small plots with 2,4-D and 2,4,5-T at different rates, to find which chemical would produce the best result and to determine the most economical rate of application. As a result of this trial, the Clerfs sprayed 500 acres of sagebrush-bunchgrass range in May 1955.

They used 1.6 pounds of the amine form of 2,4-D in 5 gallons of water per acre. Two ounces of a commercial wetting agent were added to each 100 gallons of solution. The spray was applied from an airplane.

In May 1956, Wegeleben reported that 95 percent of the sagebrush had been killed.

In August 1956, a check was made of two fenced and ungrazed plots; one sprayed, the other unsprayed. All the current year's growth was clipped on 9.6 square feet of each plot. The clippings were weighed and the total air-dry weight per acre calculated. The sprayed plot produced 780 pounds of grass forage per acre with no sagebrush growth. The unsprayed plot yielded only 185 pounds of grass, with 475 pounds of sagebrush per acre. Difference in the total weight of herbage produced per acre on the 2 plots was only about 100 pounds. But, in the sprayed plot all the available moisture and fertility were used to produce grass. In the unsprayed plot 72 percent was used to produce sagebrush and only 28 percent to produce grass.

To put it another way: If 50 percent of the total grass production was left each year to maintain grass vitality and protect the soil from erosion, then comparative stocking rates should be 1 A.U.M. (animal unit month) of grazing for each 2 acres on the sprayed plot, and 1 A. U. M. grazing for 8.7 acres on the unsprayed plot. For the 500 acres sprayed this would mean there had been an increase in grazing capacity from 58 to 250 A. U. M.'s.

Results were not as uniform over the entire 500 acres as on these test plots. Yet, Mr. Clerf estimated that he had 3 times as much grass 15 months after spraying as he had before spraying.

Increase in vigor of the grass was also quite apparent in the sprayed area as compared with the unsprayed range. Native bunchgrass and occasional crested wheatgrass plants (from an earlier but unsuccessful attempt at aerial reseeding) were not only larger where the sagebrush was sprayed, but one-third of the plants were still green in late August. Even cheatgrass growth was heavier.

The sprayed range is only a small part of one of Clerf's pastures. On April 6, 1956, he turned 650 yearling and 2-year old heifers into this pasture. One hundred head were taken out on June 20. Another 200 went out July 1, and the remainder on August 1. John Clerf said, "The cattle all came off in good condition. Even those we took off the first of August were in as good shape as those we had on irrigated pastures. Another thing! I noticed that the cattle all seemed to like the feed from the sprayed area better. Every time I came out here they

Note:—The author is work unit conservationist, Soil Conservation Service, Renton, Wash.

Sprayed area where bunchgrass is rapidly taking over the space formerly occupied by sagebrush.

were grazing in the sprayed area. This deal looks so good that we intend to spray all of our range that needs it. In fact, it would pay to spray it every 5 years if we can get these same results."

Similar results have been obtained in other trials in the Northwest. The elimination of sagebrush on another range similar to the Clerf range upped grass production as much as 3 times and increased gains on yearlings from 5.6 to 17.6 pounds per acre.

The use of chemical spray to remove sagebrush has two advantages over railing: It costs less, and it leaves the dead brush on the range to protect the soil against erosion until the grass cover is reestablished.

The spraying should be done in May in this area. This is the period when sagebrush is making its fastest growth and best results can be expected.

Wegeleben says, "Spraying operations should be done only when the wind is less than 10 miles per hour. The plane should just clear the top of the brush. The increase in forage production should be permanent, as long as careful grazing control is practiced and sufficient remnants of the perennial native bunchgrasses remain to use efficiently the extra moisture and fertility made available by killing the sagebrush."

As a result of Clerf's success, more than 2,700 acres of the same type of rangeland belonging to four different owners were sprayed in the Kittitas Soil Conservation District in 1956.

FERTILIZER VERSUS SOIL MANAGEMENT.—Commercial fertilizer is not an adequate substitute for good soil management in soybean fields, according to A. R. Albert, soils specialist of the University of Wisconsin.

In experiments, Albert found that land that was limed, fertilized, and planted to forage legumes for two or more years, prior to planting soybeans, consistently gave better crops than cornland that had been poorly managed for several years, then fertilized and planted to soybeans.

He found, however, that soybeans do respond to moderate rates of fertilization, especially potash and phosphorous, if the soil has been well managed in preceding years. He recommends 0-10-30 fertilizer for soybeans on well-managed soils and questions the economic value of nitrogen fertilizer. Rate of application should be no more than 250 pounds of 0-10-30 fertilizer per acre and should be applied as a side dressing at the first cultivation, according to Albert.

LUMBER CONSUMPTION.—Americans used 39.3 billion board feet of lumber in 1956—enough to build a 30-foot boardwalk from the earth to the moon. Softwood consumption accounted for more than 80 percent of the total. The 1956 consumption was about 7 percent below that of 1955 but 2.5 percent above the 10-year average.

Woodland Thinning

The Directors of a New York Soil Conservation District Provide Chemical Tree Thinning Service to District Cooperators.

By BARKER W. HOPKINS

AFTER 2 years of successful operation, the Clinton County Soil Conservation District directors believe they have a cheap and effective way of thinning woodlands. They've been doing it for $25 an acre. Other methods, previously tried, cost $50 to $100 per acre.

The directors think that the new scheme will step up the thinning of the district's woodlands. More than one-third of this New York county is woodlands. Because of high thinning costs in the past, valuable white pine stands had become stagnant—trees were so thick they couldn't grow to profitable size. They needed light and air. They were on starvation rations—too many trees for the plant food in the soil.

Mechanical thinning had been a costly process, so the directors turned to chemical thinning. They hired 2 men at $10 a day, supplied them with sodium arsenite, hatchets, machetes, squirt-type oilcans, and goggles and rubber gauntlet gloves to protect them from the poison. Thus equipped, the 2 men can thin from 1 to 2 acres a day.

The district offers the thinning service to cooperators at $25 an acre.

The directors are sure the farmers of Clinton County are on their way toward making more money from their woodlands. The first year farmers thinned 36 acres. In 1956, they thinned 60 acres.

The work is done during what's known as the "peeling" season: May through August. That's also the best time for using tree-killing chemicals.

Here's how the two men work: In the morning both cut the trees with a hatchet; in the afternoon one continues the hatchet work while the other squirts the killing chemical into the cuts. So far the treatment has been almost 100 percent successful.

Note:—The author is work unit conservationist, Soil Conservation Service, Plattsburgh, N. Y.

Farmers can sell the thinned trees for pulpwood if they're of salable size. In 1955, they peeled the trees after they were chemically treated. But they found the white pines hard to peel. Last year they sap-peeled the white pine trees to be thinned and did not treat these trees with the chemical. Thy had no trouble in peeling red pines after the chemical treatment.

Regardless of the pulpwood income, the farmers who have used the district's service feel they have made a good investment. The remaining trees are free to grow into valuable timber. Saw logs now bring about $40 a thousand board feet at the roadside. Properly grown, logs harvested from thinned areas can produce a much larger board-foot volume per acre in a mature harvest.

Girdling and painting white pine trees in the Clinton County Soil Conservation District, N. Y.

"I sure like this service," said Chester Thew, one of the cooperators who has been thinning his woodland. "It costs little for so worthwhile a job. It's something that we had needed badly, for like most farmers, I have never had the time myself to give my woodland the attention I know it needs. This way, the district is taking care of it for me."

A BANKER'S VIEWPOINT

Why Bankers Are Interested in Providing Conservation Credit to Individual Farmers and Ranchers and to Responsible Groups Sponsoring Soil and Water Conservation Projects.

By ENOCH T. NIX

OF all the tangible property involved in financing operations in the average American community, none is more important than agricultural land. Farming is the Nation's biggest business, and productive land is the farmer's principal basic asset.

It is just as essential that we keep up our soil reserves as it is that banks or other businesses provide financial reserves against future needs and emergencies. This principle, moreover, holds equally true for an individual farm or ranch, an agricultural community, or the State or the Nation as a whole.

In talking about the overall situation, we sometimes are prone to overlook the importance of each individual farm or piece of land right around us. But, that is what we are concerned with, because it is the productive health of our agricultural lands at home that is so important to our own community.

We come up against this fact almost every day at the bank. We know how true it is that "Poor land makes poor people." Poor people on poor land aren't good credit risks for a bank; and they aren't the best customers for our merchants. Nor can they be expected to produce adequate tax revenues for our schools and highways, State services, National defense, and other public needs.

All of these are things in which a banker is interested. He has to be in order to keep in business, quite aside from his desire to provide public service. That is why we are interested in keeping agriculture financially sound. It is why our State and national bankers associations have active agricultural committees staffed by well-informed members. That is why so many individual banks have agricultural specialists or someone else in the organization who is particularly qualified to deal with this end of our relations and services.

It has been only natural, then, that we bankers should be alert to the possibilities of conservation farming and take positive steps to help further conservation programs. The spread of soil and water conservation has been one of the most remarkable agricultural developments in our time. We, as bankers, realize we can't afford to fall behind in the procession of local, State, and National interests that are working to speed the application of conservation farming on the agricultural lands.

Farmers, through their soil conservation districts, are able to get educational and technical assistance from the Soil Conservation Service and others. They also draw upon the facilities that are available from other Government or private sources. These may include anything from obtaining help from the State fish and game department in stocking farm ponds with fish, to borrowing or renting a grader or other special equipment from the parish (county) commissioners.

The plain fact is, though, that in addition to education and technical assistance, many farmers also need initial financial assistance in order to go ahead with their farm conservation programs as fast as they need to and want to.

To do the conservation job right, a man usually has to make considerable capital investment in seed, fertilizer, labor, rental of special machinery, and other items. Then, a farmer may have to wait a few years before his new system yields higher returns than his old one gave him, and find himself financially pinched in the meantime.

Actually, the only places this supplementary financial aid can come from, is either from private or public credit sources, or from direct Government cost sharing. Conservation cost sharing, notably through the Agricultural Conservation Program, and now through the newly expanding small watershed work, cannot nearly meet the total needs for conservation financing. Moreover, the Government is placing

Note:—The author is vice president, Bossier Bank and Trust Company, Bossier, La. He is also chairman of the agricultural committee of the Louisiana Bankers Association.

Enoch T. Nix.

increasing weight on the factor of public benefit in agreeing to share the cost of watershed protection and similar undertakings. Credit, heretofore available from Government agencies or lending institutions, for conservation improvements similarly has been limited.

Private bankers in increasing numbers throughout the country have developed an understanding and sympathetic attitude on the conservation credit needs of their customers. Many have taken the initiative in developing vigorous programs to promote soil and water conservation in their areas. It has simply been a case of realizing the opportunity for private banks to step into the conservation credit field, with profit to themselves, while at the same time doing a real service for their customers and the public. And, I assure you that our conservation-minded bankers want our farm customers to make fullest use of our services and facilities in conservation credit.

In this connection, I should like to call attention to the action of the 83rd Congress in amending the Water Facilities Act to make insured private bank credit available for financing soil- and water-conservation measures in all States. One practical advantage is that the borrower, the banker, and the Government work together in this conservation credit financing. Thus, when a banker has a customer who needs such a conservation loan he may send him to the local Farmers Home Administration office, indicating that the bank is willing to lend the money. The FHA office, in turn, passes on the application and processes it, advises the bank the loan is a desirable one, and finally gives the bank a guarantee for the full amount of the loan.

But, I should like to emphasize that we in the private banking field are not going to look upon insured Government credit arrangements as a substitute for our own conservation financing opportunities and obligations. The annual appropriation available for insured loans certainly is not enough to meet the needs of the farmers and ranchers who would find it good business to borrow money to go ahead with their conservation work. It is obvious, therefore, that the private commercial banker will continue to be a main source of conservation credit.

The new emphasis on small watershed protection and flood prevention appears to me to hold special promise from the community standpoint. There are few communities, indeed, that have not suffered costly damage from recurring floods on even small creeks and rivers. Many others have suffered from silting up of their municipal, power, or irrigation water reservoirs, or from having their water supplies curtailed through ground water depletion. And, too many communities have felt the general effects of declining agriculture because of poor land use and water waste in their watersheds.

Personally, I believe this approach to some of our land conservation and flood prevention problems is going to be increasingly effective as time goes on, because such watershed undertakings are basically local —not Federal — projects. They may be initiated and sponsored by local people in the community, who must stand their full share of the cost of such programs. I think we in the banking field will have the opportunity of doing a major service in soil and water conservation by making our financing facilities available both to individual farmers in project watersheds and to watershed associa-

tions or other interests sponsoring this work.

A good, sound conservation plan is fast becoming a necessity for today's progressive farmer or rancher—as a blueprint to efficient and stable operations, as a guide to what the return will be on his investment, and as a dependable credit support. By the same token, a "conservation bank plan" is fast becoming a necessity for every banking institution which operates in the field of agricultural credit. Thus are our efforts joined in the community of interests in which every group shares the responsibility of helping to build a more secure and satisfying future.

THE AMERICAN OASIS. By Edward Higbee. 259 pp. Illustrated. 1957. New York, Alfred A. Knopf, Inc. $5.00.

This book is an excellent discussion of our "land of plenty", how it got that way, and how we may keep it that way. A very interesting and readable book, mainly because it gives so many intimate details about American agriculture. These details may be obtained only by reading a book like this, or by personally making a long and arduous tour as the author did to collect his material.

This book deals with most types of agricultural problems in the United States and especially with soil- and water-conservation problems. It contains considerable historical material from Indian times to the present, but it is mainly about current and future problems. Present day surpluses and probable future shortages are discussed. The phenomenal progress and increased efficiency of American farmers during the last few decades is a main theme throughout the book. Yet, the author reserves his main arguments to point up the needs for soil and water conservation, and to tell some of the ways modern American farmers and progressive communities are going about this task. He dedicates the book to field technicians of the Soil Conservation Service and farmers of America's soil conservation districts.

Obviously, the author has traveled extensively and done much research in gathering his material. After three introductory chapters in which he presents the basic problems, he discusses many of the specific problems by regions. Several case histories of typical farmers or communities, that are using up-to-date scientific methods in production and conservation, are given for each of the major agricultural regions of the United States.

For those who wish to get a comprehensive review of current agricultural problems in most of the important regions of the United States, this book is highly recommended. The book also deserves wide reading by conservationists who wish to have this land remain: "The American Oasis."

—Tom Dale

FLAT TOP RANCH, The Story of a Grassland Venture. Edited by B. W. Allred and J. C. Dykes. 232 pp. Illustrated. 1957. Norman: University of Oklahoma Press. $4.00.

It works! Range conservation, when put to the test of practice, produces results. The story of Flat Top Ranch is the case history of one convincing example.

In 1938, Charles Pettit bought a little rundown ranch of 7,000 acres in central Texas. Adjoining the ranch was a community of equally rundown farms. Over the years Pettit added one of these farms after another to his original holding until now his boundary fence encloses 17,000 acres.

From the beginning, his ranch was "dedicated to the improvement of Herefords." He knew that cattle depend on grass, and that grass depends on soil and water. So he devoted his efforts to rebuilding soil, conserving water, and restoring grass along with the breeding and feeding of livestock.

His concern with conservation soon led him to the State college and experiment stations, the county agent, and the Soil Conservation Service. He became a cooperator with the Bosque Soil Conservation District.

He and his ranch manager planned for "permanence and profit." They rebuilt fences and roads, installed water facilities, built dams,

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and killed brush. Most of all, they nursed their grass from a predominantly poor condition to fair to good—some to excellent condition—in the face of the worst drought of recent times.

Louis Bromfield saw the ranch, recognized its conservation significance, and suggested a book to tell its story. He contributed two chapters. Conservationists and others who had consulted with Pettit and watched the ranch's progress returned to appraise the results.

Many of these conservationists contributed chapters: B. W. Allred on grass improvement; J. C. Dykes on water; W. R. Van Dersal on wildlife; Frank Reeves, livestock editor of the Ft. Worth *Star-Telegram,* reported on ranch improvements; ranch manager W. B. Roberts and superintendent G. O. Hedrick wrote of their livestock and farming operations, and several chapters by Martime Emert of Texas Christian University rounded out the story.

Allred and Dykes completed the editing of the book after Bromfield's death.

Despite some unevenness in presentation, the several chapters by people intimately acquainted with different aspects of the ranch give a thorough account of the Flat Top story. But Charles Pettit's 14-page Preface carries the real punchlines; here he gives the philosophy that is back of his grassland venture.

—BEN OSBORN

SPORTSMEN'S CLUB.—The Clinton County Farmers' and Sportsmen's Club of Ohio purchased an 87 acre farm in 1956 to establish a wildlife refuge. The farm manager immediately asked the local soil conservation district and SCS technicians to help in developing a farm-wide conservation plan. During the first year of operation the club has built a large farm pond, laid out 35 acres of contour stripcropping, constructed 600 feet of diversion terraces, planted 20,000 multifora rose, and set out 2 acres of trees. Still other conservation projects, including 2 more ponds, are underway.

COOL SWIMMING.—Mr. and Mrs. Peter Ladzinski are enthusiastic conservation farmers. They have been since they became cooperators with their Franklin Soil Conservation District in 1954.

In 1956, they reviewed their conservation work to see how they stood. They figured they needed one thing more to complete the overall conservation program on their Hemlock Hill Farm near Northfield, Mass. It was a farm pond for fire protection and recreation.

A soil Conservation Service engineer staked out a site close to the farmhouse and designed a pond 6-feet deep. Then the Ladzinskis really got enthusiastic. In fact, they got impatient. They wanted to get the pond done. For one thing, Mrs. Ladzinski wanted to swim in it before cold weather set in. And cold weather in northwest Massachusetts sets in early.

A delay in getting pipe held up the work. Then there was another delay in lining up equipment.

As delays piled up, Mrs. Ladzinski's enthusiasm drooped as here determination rose. "I'm going to swim in that pond this year if I have to break the ice to do it," she vowed in the presence of witnesses.

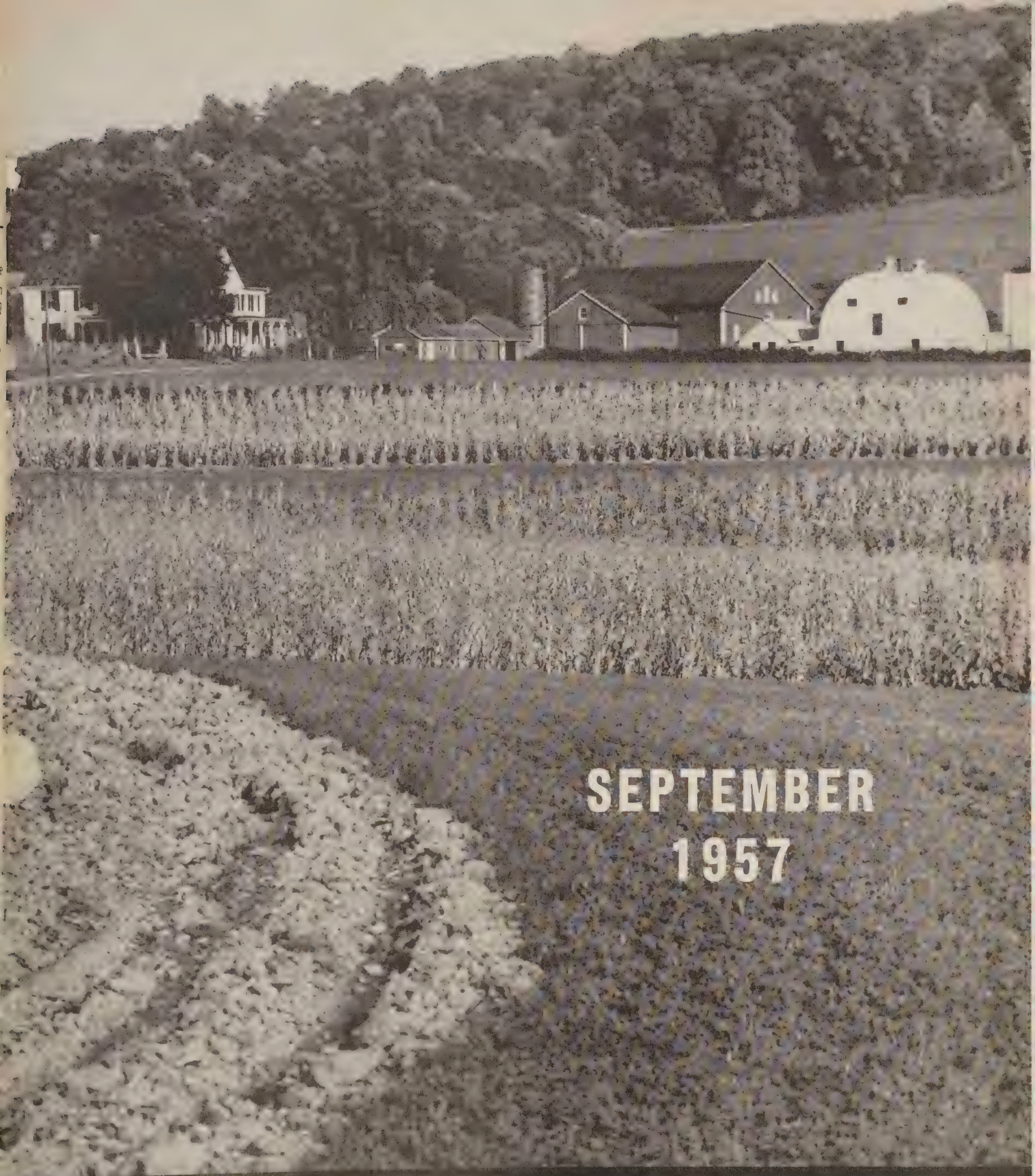
The pond was finally finished in October. It took weeks to get 4 feet of water in the pond. But on a ch November 2, Mrs. Ladzinski kept her vow. She h her swim.

—EDWARD G. KONIECZNY

CONSERVATION FELLOWSHIPS.—The National Wildlife Federation will award a number of fellowships to qualified individuals working in the field of conservation or conservation education for the school year 1958-59. A maximum of $1,000 may be granted to graduate and post-graduate students. Undergraduate fellowships are limited to a maximum of $500. According to the Federation's Washington, D.C. office, all applications for such fellowships must be submitted before December 31, 1957.

ONE PROGRAM.—Soil and water conservation can't be separated. The watershed approach, on which we are experiencing renewed emphasis, has been part and parcel of our soil conservation concept since experimental and research work started nearly 30 years ago.

—D. A. WILLIAMS, *Administrator*
Soil Conservation Service



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OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

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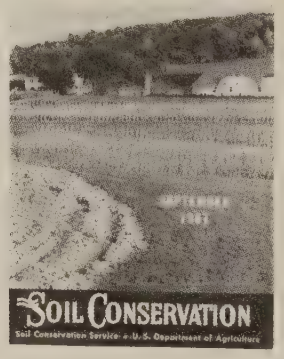
TWENTIETH ANNIVERSARY. — The highlight in observing the 20th anniversary of the passage of the South Carolina Soil Conservation Districts Law, on April 17, was a concurrent resolution by the Senate and House of Representatives of the State Legislature giving recognition to the event.

The resolution cites: "The notable progress made by the more than 41,000 landowners of the State who are utilizing the resources of the districts in developing and applying technically sound soil- and water-conservation programs on the more than 7 million acres of farmland operated by them."

Commended in the resolution for their accomplishments were "the 220 public-spirited farmers, now serving as supervisors in the 44 districts, and the several hundred additional individuals who have so served during the past two decades."

Newspapers of the State publicized the event widely.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—The farm of Mrs. Nellie Thrasher, near Jefferson, Md., 4 years after a complete conservation program was established in 1 day.

—Photo by Hermann Postlethwaite

Group Action in Damodar Valley

A Soil Conservationist Explains Some of the Problems Encountered in Getting Conservation Farming Started on Small Fields of Farmers in India.

By W. W. HULL

FROM about 1940 until 1953, while I was with the Soil Conseration Service in the United States, I heard a lot of talk about "group farm planning," "group action," "working with natural neighbor groups," and the like. I read a lot about them too, and talked about them, and wrote about them some myself. But, it was only occasionally that I had a part in doing them.

I reached India in August 1953, and looked around the Chota Nagpur Plateau, of Bihar State, where I was to work. I realized at once that we would have to work with many groups of people if we expected to establish any kind of conservation farming pattern. There simply wasn't room enough to do it on one man's small, narrow strip of land. The custom for untold generations was to divide the farmland among the children, until by the simple factor of multiple divisions, strips of land, 10 to 20 feet wide and up to 800 feet long sometimes would be the inheritance given to a son. In order to establish any conservation practices over a good sized area it would be necessary to combine these many and various sized plots of ground belonging to as many varied owners.

We have established some soil conservation farming by working with groups of these farmers and that is the main point of this story. But before we discuss that I should like to tell why I am in India, a little about the people with whom I work, and the conditions and problems with which we have to deal.

I came under the Point Four program as a consultant in soil conservation to the Damodar Valley Corporation, known locally as DVC. This is a public corporation patterned after TVA. It was established in 1948, and has responsibility for harnessing the unruly Damodar River and developing its valley.

In the past, the Damodar has had some terrible floods. To stop or reduce them is DVC's first objective. Second, in importance, is to provide irrigation for more than a million acres of land in the lower valley. These objectives are being accomplished by means of 4 major dams. These dams and 2 thermal stations will develop over 400,000 kilowatt hours of electric power. The irrigation canals will improve navigation in the lower valley. Several headwater dams have been built and others have been planned.

The watershed above the lowest dam covers about 7,200 square miles. There is a lot of erosion in the upper valley. It has a monsoon climate with average annual rainfall of about 50 inches. Half the rain comes in July and August and 82 percent from June through September. Rainfall intensity is sometimes high.

Rice is by far the most important crop. It is grown during the monsoon mostly without irrigation. The regular riceland is bench terraced and there is no erosion problem to speak of. The terraced paddy fields make up about 20 percent of the upper valley, or nearly one million acres.

Maize, potatoes, wheat, mustard for oil, and vegetables of many kinds are grown near the village homes on land that is nearly level. This land receives heavy applications of ashes and

Note:—The author is soil conservation advisor employed by the International Cooperation Administration, assigned to the Damodar Valley Corporation with headquarters at Hazaribagh, in Bihar State, India. Previously, he was a zone conservationist for the Soil Conservation Service, Spartanburg, S. C.

Contour plowing of terrace line in Damodar Valley.

animal manures and occasionally chemical fertilizers. It is mostly class I land and is farmed intensively with fairly good yields. It is usually the only land that is fenced. There are only about 80,000 acres of such land.

Further away from the homes, crops such as gram, pigeon peas, upland rice, millet, and oilseed crops are grown. These lands are not manured as heavily as those adjacent to the homes. A small area receives enough manure to permit cropping every year, but most of it is never manured and is cropped only 1 year out of 2 or 3; the rest of the time it is left fallow. The volunteer grasses, legumes, and other vegetation are grazed heavily. Yields on this land are very low—frequently only 3 to 6 bushels per acre. However, some of this soil is potentially very productive.

None of these sloping upland fields is terraced, although a few have small bunds along the property edges that have tended to cause benching. By American capability classification standards the land would be mostly class II and class III, with less class IV. There are slightly less than a million acres of these uplands.

Most of the upland soils are slightly acid, red, sandy loams. They are not laterites, but have been influenced by the laterization process and contain large amounts of iron and aluminum. When dry and barren the undisturbed surface becomes glazed with iron oxide and is very hard. Unless the crust is broken with a plow, infiltration is slow and runoff is great. There is a small acreage of gray, calcareous, clay loam soil. These soils shrink and crack badly during the dry season.

Both types of soil are subject to severe gully erosion. Gullies in the red soils have vertical or caving heads. In the gray soils, gully heads usually are inclined. Gullies start near water courses and extend up from there. In a few cases, they have met by cutting across dividing ridges.

Farmers maintain their cattle, buffaloes, sheep, and goats on land they do not own, not only by custom, but by legal right. Some of the land belongs to their neighbors; some of it is set apart as common grazing ground; some is forest land, which belongs to the State, but on which farmers have rights to cut and graze; some is idle and is aptly named "wasteland." This also belongs to the State. There is no incentive of land ownership to encourage farmers to regulate grazing; it is overdone to the extreme.

Bad land management practices have led to severe erosion not only on upland fields and grazing grounds, but in the forests as well. There are vast areas of completely gullied land that we in the United States term class VII or VIII. These gullies are eroding good upland

fields and sending countless tons of soil into the newly made reservoirs.

With commendable foresight, the DVC established a soil conservation department in the early days of its existence. It is a complete unit with Forestry, Engineering, and Agronomy Divisions.

The people engaged in this work are well qualified. They have had fewer years of experience with field operations than comparable groups in the United States, but have had more formal education.

When I arrived, I found that this organization had done work of high quality on land that DVC owned or controlled, and this work has continued. Accomplishments include reclamation of 7,000 acres of eroded wasteland by machine clearing and terracing. This was used to resettle people who were displaced by the reservoirs. About 2,000 acres have been reforested and fenced and are being properly managed. The Forestry division is now planting trees at the rate of 1,000 acres a year and is collaborating with Bihar State in planting 4,000 acres a year within the valley.

Five medium size dams provide 15,000-acre feet of storage and supply irrigation water for 4,700 acres. Several smaller dams provide water for resettled villagers and add to the irrigated area.

Soil surveys have been completed on more than 300 square miles. Research, which is under way, includes the testing of fertilizers and cultural practices on various crops and crop rotations, studies on the adaptation and management of forage grasses and legumes, and measurement of soil and water losses under different cropping and management practices.

Little soil conservation work, as we know it, had been done on farmland prior to my arrival. The Extension officer and his associates had conducted many demonstrations of improved cropping practices, including the use of fertilizer and better seed on farmers' fields. These had been effective in arousing the interest and gaining the confidence of farmers in several villages. So the stage was set for a complete program of the proper use and treatment of farmland.

In the spring of 1954, Extension officer, S. P. Sahai and his assistant M. N. Jha, persuaded 34 landowners and sharers to undertake a complete job of soil conservation on 17 acres of sloping upland. This gets us back to group action. There wasn't any way to terrace this land and provide a proper water-disposal sys-

Constructing a terrace with native equipment in Damodar Valley.

A terraced field, planted to corn, soon after a rain.

tem without crossing property lines at innumerable places. This would cut the already small fields into still smaller segments.

The only possible way to do the job right was to rearrange their properties along contour lines. I was skeptical that 34 farmers could be persuaded to join in such an undertaking, but my coworkers set out to do it, and they did. At that time it was the most outstanding example of group action I had witnessed. Since then I have seen some that surpass it.

A 50 acre tract of upland in Nawdiha village will serve as an example of what I mean. This land was registered in the names of 32 farmers, but in addition there were 109 relatives who either farmed cooperatively with them or cultivated a part of the land separately. There were 204 surveyed and numbered plots, each one recorded in the court's books. This land was divided into narrow strips; some running up and down the slope and ending abruptly in gullies.

We temporarily ignored the property lines and developed plans exactly as we would on a single farm in the United States. We laid out a land-use plan and water-disposal system including roads, terraces, waterways, and structures. As best we could, we divided the area into cropland and permanent meadow on the basis of inherent capability, the requirements for safe disposal of water, and on the needs and wishes of the farmers.

The land was bordered on three sides by gullies. Some of these gullies had been reclaimed into paddy fields by bench terracing; others were raw, with vertical, caving heads.

A strip of land between the gullies and the cropland was planned for permanent meadow. The meadow was to be planted to tall forage grasses that would be cut and fed, but not grazed.

We planned two access roads on ridges, and laid out graded terraces to drain from these roads into sodded outlet channels or to the meadow areas. The cropland was to be farmed on the contour with a rotation of crops that included legumes and cereals. All crop and meadowland was to be fertilized. A few of the more active gully heads were to be sloped and sodded. Mechanical structures and sod flumes were to be provided to take water into the gullies and paddy fields.

The deal we worked out with the farmers was that they would build the terraces and we (D.V.C.) would establish the grass waterways and all necessary structures. DVC would bear two-thirds of the cost of sloping and sodding gully heads and of putting small diversion channels around them. Also, DVC would furnish fertilizer for the crops and meadow the first year, and half the fertilizer the second year provided the farmers would first supply their share. This land had never had any chemi-

cal fertilizer before and had had very little organic manure.

The plan was that each farmer would give up his scattered, long, narrow fields and we would reallot to each of them a portion of the land for cultivation and meadow, with the consolidation of holdings into 32 contour cultivated fields and 32 meadow fields. All cultivated land would be parallel with the terraces. The proportion of grassland to cropland would be approximately the same for each man. Each would contribute his land share to the roads and waterways which then would become common property for the use of all.

All of these plans were executed in 1 year except that the planting of grass was not completed. Yields were far better than these farmers had ever known.

The village of Nawdiha is a fairly typical example of the work that is being done and that is gradually being expanded. From a start on 17 acres in 1954, Messrs. Sahai, Jha, and the other workers associated with them, have now treated 1,100 acres in 19 villages. They have consolidated the property holdings on the contour on nearly 700 acres.

To American work unit conservationists, with large goals, these figures are perhaps not impressive. The size of the job looms larger, however, when you consider all the complications and people involved.

In another area we had 163 acres of land in 4 representative villages. The ownership of this land was surveyed and mapped in 1911-12. At that time there were 202 owners and their land was divided into 1,042 numbered plots. Since then, 15 acres had been consumed by encroaching gullies. In our planning we used 2 acres for roads, 3 for grassed waterways, and put 37 acres in permanent meadow. That left 106 acres of cultivated land to be redistributed to the 202 farmers in strips parallel to the terraces. The job of measuring, distributing, and staking out this land was a large one.

Then, what about getting 202 people to agree to accept the land allotted to them? Actually it was much more complicated than that, because the number of sharers (brothers, sons, etc.) had increased to 612 since the survey was made. We did not attempt to divide the land among different members of a family; that was left to them. But, all these sharers did increase tremendously the number of people to deal with and to satisfy.

I think most Americans must, by now, be wondering how it was possible to get so many people to agree to something so revolutionary. I am still filled with wonder myself, because land ownership is a vital thing to Indian villagers.

One thing that has helped is that the soil in these upland fields is rather uniform. The land a man gives up is about similar to what he gets in return. Then too, consolidation of

Grass waterway serving as a terrace-outlet channel for a group conservation project in Damodar Valley. (above) Waterway after shaping; (below) after a year's growth of fertilized bermudagrass.

Indian farmer harvesting the best corn crop he has ever grown from a recently terraced and fertilized field.

scattered, small holdings is to them a decidedly practical thing.

Take the case of land owner Mina Mistri, and his three brothers who share the land with him. Mistri is one of the larger landowners of the Nawdiha village. He and his brothers have other land, but in the 50 acre block on which we worked, they had 3.9 acres. It was divided into 26 plots at 7 locations. Each brother had land at each location.

The distance between the two most widely separated plots was 1,700 feet. For these fellows to move from plot to plot in every farm operation was quite a chore. Now, their cultivated land has been reduced to 2.5 acres, but it is all in one place and it fits perfectly into a pattern of conservation farming. In addition they have 1.2 acres of grass nearby.

Still another explanation of why all these people could agree is that the combination of practices—terracing, contour cultivation, fertilization, line sowing rather than broadcasting, better seed, better weeding, and use of insecticides greatly increased production.

Let's see how our man Mina Mistri and his brothers come out; not exceptionally well, as a matter of fact. Their crop was among the poorest in the Nawdiha Project; about 20 percent below the average. Yet, their crop of upland rice on their 2.5 acres was valued at $72. The cost of fertilizer, seed, and insecticides was $28. Their net labor income was $44. According to their estimates their previous crops on 3.9 acres were worth $36, but this was produced in alternate years only.

A more impressive case is that of Gosh Mohammed of Romi village. He and his neighbors had completely abandoned an upland field and it had been idle for 15 years. After terracing and having the plots consolidated and reallotted, Gosh Mohammed had 3.6 acres for cultivation. In 1956, he had a yield of 2,050 pounds of upland rice per acre. The net value above the cost of fertilizer, etc., was $42.50 per acre, or $153 for the 3.6 acres, which had produced nothing in the last 15 years.

The 124 farmers of Lupung village did exceptionally well on their 24 acre upland field. After terracing and consolidating their holdings, they planted a mixture of upland rice and pigeon peas. Their average production was 1,520 pounds of rice and 600 pounds of pigeon peas per acre. This was worth $53 an acre after deducting the cost of materials, and compares with less than $8 an acre they were making before their conservation plan.

However plausible these explanations may be for our success in persuading so many farmers to cooperate, still another reason must be mentioned. It is that Messrs. Sahai, Jha, and their helpers have done a fine job of working with and leading these people to take action. They have not pushed them. They have taught them and led them. The first group took action because of faith in these technicians based largely on what they had seen them do with fertilizers. Since then the leaders of new groups have been taken to the villages where conservation work had been done or was in progress. They have seen the crops on the new fields and have talked to the farmers who did the work. The grapevine has been working, and now each group knows what it is getting into.

Even so, it hasn't been easy. One group backed out, even after we had run the terrace lines. But after watching their neighbors in the next village for a year, they put their thumbprints on another application. Of course, we will have to run the terrace lines all over again.

Another group refused at first to accept the

allotment of land. We followed a rule of allotting land to each man as near as possible to the place where most of his land was before. But, most of the people wanted their new land to be near the top of the slope.

The technicians first explained how the allotment had been arrived at. Then they said: "It doesn't make any difference to us how the land is divided. We have done it as fairly as we know how. Suppose you do it yourselves. Select a committee. We will make available to you all our maps and measurements and our surveyors. You divide up the land and whatever you agree on will suit us fine."

The people struggled with the problem for a week, then came back and said: "We'll take it as you have it."

Of course it is not humanly possible to please everyone in an undertaking of this kind. Occasionally a man gets land that isn't quite as good as he gave up. Some few are disgruntled; but, the vast majority are in agreement. Most of the consolidation is still on an informal basis and has no legal status. Even so, we think it is permanent because it would be hard for the farmers to go back to their original plots. All evidence of where the old plots were has disappeared.

Half-pipe spillway made from sheet of corrugated iron roofing empties water from grass waterway to gully.

Coastal bermudagrass pasture in Damodar Valley. Such pastures are not practical in most communities because of extreme overgrazing.

In Sirsi village, 26 farmers have signed the legal papers to surrender their long, straight, narrow plots. The legal authorities have issued deeds to them for their new contour-bounded fields. This has set a precedent that can be followed by other groups provided they all agree.

So far it is all voluntary and there is no way to bring any force of law into the process. The only force available is that of majority opinion. This may not be enough in some cases, especially if subsidies should be withdrawn. Legislation by which a few dissenters can be brought into line is being worked on.

In all this work some things have made us feel good, others bad. On the good side, we know we can handle the physical problems even though some are tough. The farmers can build good terraces with their own equipment. On the first job we undertook, we constructed a sample terrace with a tractor and 2-disk plow, using the island method. The farmers built the other terraces with their bullocks, wooden plows, and board scrapers.

One terrace was as good as the other. All were fairly small—about 5 square feet cross section—but had a good shape. Because of the small size and the difficulties involved in maintaining the terraces with the local plows, we spaced

them closely. Also, because of this maintenance problem most farmers prefer to build a high, narrow ridge that is left uncultivated and grows up in grass.

As often as not, the upland fields are bounded on one or more sides by a mass of gullies with caving heads. Usually water is carried toward these gullies by terraces. Before it gets to them it is intercepted by a sodded channel that runs parallel to the line of gullies. These channels have been quite satisfactory in spite of the heavy grazing. The water is dropped from a channel into a gully by means of a sodded flume when the gully head is low and the volume of water is small. When this is not practical, we have used masonry chutes. These are expensive and are being replaced to a large extent now by cantilever pipe or half-pipe spillways. The half pipes are made from corrugated metal roofing sheets. They are inexpensive and have been quite satisfactory through one monsoon.

We know we can grow good grass with fertilizer, but, there are two problems in grass production. One is to protect it from overgrazing, since fencing is expensive. The other problem is how to make grass production economically feasible. The quality of the cattle is so poor and the size of the farms so small that farmers can't afford to spend much money on fertilizer and fencing for grass. But the fact that they have been willing to put some of their land in permanent grass is in itself encouraging. A good many have harvested grass with small hand sickles and fed it to their cattle.

As the National Extension Service program for upgrading the cattle progresses, it may become more feasible to spend money on the production of feed. Even so, we do not think it will ever be possible to produce enough feed for the present cattle population.

A lot of farmers who never used fertilizer before are buying it for their crops. There is no doubt that this is profitable. It has been proved by controlled experiments and by demonstrations on many farmers' fields.

One thing that discourages us is the size of the job of measuring land for consolidations. It takes an enormous amount of time and work. But, it is the only way we can do the job right and we think it is worth the effort. A lot of holdings have been consolidated in other parts of India, but not in a contour pattern. The Bihar Government is setting up a scheme for consolidation under a new law. It may be that by working together, we can find ways to simplify the measuring problem.

The consolidation of fragmented holdings along contour lines makes possible the planning and application of a good soil- and water-conservation program that is nearly impossible to achieve on the present ownership pattern. We are saving land that would otherwise be destroyed; and, it is potentially good, productive land. We are increasing efficiency by giving farmers their land in larger but fewer pieces. And we are getting groups of farmers to work together for their mutual benefit in a way that should lead finally to a partial solution of a lot of their probems.

Pines and Strawberries

Louisiana Farmers Increase Their Strawberry Profits by Better Management of Pine Woods.

By MEREDITH A. PETERS

RAPID-GROWING, thrifty pine trees have a double value to a strawberry farmer of Louisiana. In fact, if his pine trees don't do well a farmer is likely to think more about the effect on strawberry profits than the loss of harvestable wood products.

Concern about his dying trees led H. P. Hoover, a truck farmer 7 miles east of Ponchatoula, La., to ask the Bogue Chitto-Pearl Soil Conservation District for help in planning a conservation program for his farm.

Gurley H. Mixon, of the Soil Conservation Service, suggested that the overcrowded pine thicket be given proper spacing. He explained how this would result in an increased production of pine straw, which is the local term for dead pine needles.

Mr. Hoover, with assistance of SCS technicians, marked the pine thicket for thinning in the fall of 1954.

Note:–The author is woodland conservationist, Soil Conservation Service, Alexandria, La.

H. P. Hoover inspects his loblolly pine trees and the pine-straw crop.

More than $10.00 per acre was realized from the wood products taken out in the thinning operation. Mr. Hoover is well pleased with his properly spaced pines and his straw production has increased 50 percent.

Hoover states: "Before thinning, my pine trees produced enough straw to mulch 40,000 berry plants. This year it produced enough to mulch 60,000 plants, and I did no hand raking."

Phillip Mancuso, also a cooperator with the Bogue Chitto-Pearl River Soil Conservation District, has a truck farm 3 miles south of Amite. Strawberries are an important part of his truck farming. Pine straw is placed around his berry plants in December to assure clean, high-grade berries. With mulching completed, he waits for the white blooms which begin to appear in late February. It takes 20 to 30 days for these blooms to develop into ripe strawberries. A frost at this time would set the crop back 3 to 4 weeks. A heavy March frost could cause a crop failure. If frosts are anticipated, after blooming begins, Mr. Mancuso rakes pine straw over the plants from the edges of the rows. The plants are then capped with new straw. This pine straw saves the strawberry crop from frost damages.

Pine-straw mulch under ripening strawberries on the Mancuso truck farm.

Pine trees grow on 95 percent of the strawberry truck farms in Tangipahoa and Livingston Parishes. New needles are formed from pine tree buds in the spring and summer. These new needles remain alive 2 years, then fall to the ground as straw.

Pine thickets can be rated as high straw producers and low straw producers. A high straw producing thicket has well-spaced trees with one-third of the height in green limbs. Lack of proper spacing results in low straw producing thickets. Crowded trees have small tops which produce little straw. On a well-managed thicket 2 acres of pine trees will produce enough straw to mulch one acre of strawberries.

Sufficient pine straw to mulch an acre of 20,000 strawberry plants costs around $75 if purchased. Hence, a 50 percent increase in straw production from an acre of pines may mean a saving of as much as $20 or $30 a year to a strawberry farmer. In additon, it probably means that the pine trees are growing 50 percent faster and that the harvest of wood crops will be that much greater.

NATURAL RESOURCES can have no significance except as they are related to the needs of people. Fertile fields, great forests, the latent power of our great rivers, are of concern to us only as we can use them to satisfy our physical needs. Resources require management to prevent their exhaustion and needless dissipation. They are to be used wisely so that they may be renewed after each use. Conservation means use without abuse—the use of the product without eating up the capital.

—Ervin L. Peterson,
Assistant Secretary of Agriculture

There Oughta Be A Law . . .

. . . To Regulate Strip Mining: West Virginia Has One.

By EVERETT LEADBETTER

YOU are gliding along a ribbon of super highway through beautiful country. You see green pastures dotted with sleek cattle; fields of ripening crops, the rows gracefully curved around the contours of the land; the hillsides in an artistic pattern; wooded mountains looking cool and refreshing; now and then a roadside picnic area shaded by sheltering trees; an occasional park with its well-groomed look of green velvet. You have a feeling of pride, pleasure, and inner contentment as the lovely scene unfolds.

Note:—The author is State soil conservationist, Soil Conservation Service, Morgantown, W. Va.

Then, as you swing around a curve in the highway you get a rude jolt. The scene has changed. Ahead of you on the right the land is torn up into an ugly mass of raw earth. A vast hole, big enough to entomb a whole modern shopping center, gapes at you. Barren soil with mounds of shale and chunks of coal are piled up in desolate hills. It's a strip mine!

Your indignation rises. You exclaim: "There ought to be a law against this."

Well, in West Virginia there is a law. And, it's working.

Under West Virginia law, a strip mine operator must post a bond to assure restoration

Strip mine in Northern Panhandle Soil Conservation District, W. Va.

Strip mine area on land of William Compton that has been leveled, fertilized, and seeded to alfalfa. (above) The field immediately after seeding. (below) General view of the field after alfalfa has become established.

of the land. He has to comply with the law in restoring the land before he can be released from his bond. Of course, the requirements are minimum and the public isn't always happy with the restoration job.

But, the law also authorizes soil conservation districts to restore the lacerated land for the mine owners. In that respect, West Virginia may be unique. A mine operator is released from his bond when he completes arrangements with a district to restore the land.

This makes it work out better for everyone. The mine operator doesn't have to wait till the land has been restored to get released. The district doesn't have to worry about getting released from a bond; so, it's in no hurry. It can do the work at the time of year that's best. And it gets help from Soil Conservation Service technicians who know best how the land should be restored. The public benefits by getting a better job.

Then, too, the districts make a little money on the deal. That helps them do a better conservation job for all the farmers.

Restoration of strip mine area on land of Mike Starvaggi. (above) Grading and smoothing the spoil banks. (below) The same area after restoration is completed.

ECONOMIC OBSTACLES TO CONSERVATION FARMING

The Desire for More Corn in Conservation Rotations Prevented Many Iowa Farmers From Adopting Soil Conservation Plans. Recent Research Shows That Mechanical Soil Conservation Practices and Proper Fertilization Will Permit Larger Corn Acreages While Holding Soil Loss to Less Than 5 Tons Per Acre Each Year.

By MELVIN G. BLASE

No. 27

This is the twenty-seventh of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

THE seriousness of erosion on the loess hills of western Iowa and the rather slow progress in controlling it led the U. S. Department of Agriculture and Iowa State College to start a research project in 1949 to analyze the economic obstacles that apparently were preventing more rapid adoption of soil conservation practices. The study also was designed to ascertain the rate of progress farmers were making in the adoption of conservation practices.

The main feature of the study was to give a group of random selected farmers a choice between two conservation plans: One, designed to control erosion and maintain soil productivity mainly through the use of forage crops in rotation with corn and other clean cultivated crops; the other, to provide for a maximum production of cash grain with a maximum use of mechanical erosion control practices, based on the existing technical guides of SCS. Each plan was designed to reduce soil loss to less than 5 tons per acre per year.

When shown the vegetative control plan, in 1949, a common reaction of a great majority of farmers was: "That conservation plan is all right, but I must have more corn in the rotation." Many farmers wanted to grow even more corn than allowed in the plans that called for a maximum use of mechanical practices, such as terracing, contour tillage, and diversion ditches.

When interviewed again, in 1952, most farmers reemphasized the need for more corn than was recommended in the conservation plans.

As a result of the findings in the 1949 and 1952 studies, a current study is underway to ascertain the progress farmers have made in reducing soil loss during the last 5 years, and to determine the kind of conservation plans they prefer.

In the earlier studies, it was found that farmers had several economic reasons for objecting to soil conservation plans. More farmers objected to the high-forage rotations in the plans than to any other practice. Many disliked them because of the number and kind of livestock necessary to use the extra forage. In this area, corn is normally more profitable than forage. The need for immediate income to make mortgage payments and to meet operating and living expenses prevented adoption of the plans on several farms. The landlord's failure to cooperate and the current rental arrangement were obstacles for some farm operators. The short expectancy of tenure and the small size of some farms were mentioned frequently in giving reasons for lack of full adoption of the conservation plans.

As a result of objections of this kind, soil conservationists and researchers tried to find ways to control erosion that required less forage in the rotation. Mechanical practices, such as terracing and contour listing, proved to be effective in this regard. Consequently, in recent

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years, adoption of more terracing and other mechanical practices has been emphasized.

Within the last year, engineers and agronomists have revised their recommendations for erosion control. These recommendations give additional encouragement to the use of mechanical practices, as they now appear to be more effective than was previously believed. The revision in erosion-control recommendations was made on the basis of research by the Iowa State College and a Slope-practice workshop. The workshop was held at the request of Soil Conservation Service State conservationists from the nine Midwestern States. Its purpose was to reevaluate the factors used for estimating soil losses, on the basis of 10 years additional research.

The research indicated that greater emphasis could be placed on mechanical practices, for several reasons. Mechanical practices proved to be more effective than was previously believed, while some rotations were somewhat less effective. Terraces were effective on slopes up to 20 rather than 12 percent, as had been previously recommended. Nitrogen fertilizer, as a source of nitrogen, has also proved to be effective in replacing legumes in rotations.

Changes in erosion control recommendations based on research data were the primary basis for revisions in the farm plans that were developed for this third study of "Obstacles to adoption of soil conservation practices."

The revised plans, which call for a maximum use of mechanical practices, allow 55 percent more row crops than the 1949 plans. The greatest increase in acreage of row crops is on farms where the topography is rough. On these farms, the revised plans permit almost twice as many acres of corn as did the old plans. Farms with the smoothest topography had less row crops, on the average, from 1949 through 1952, than the new plans permit. However, during the same period, farmers on the roughest land had an average of 38 percent of their tillable acres in row crops as compared with 28 percent in the new plans.

What effect will such changes in farm plans have in conserving these and other similar hilly, loessial soils? In allowing farmers to maintain their acreages in row crops by installing terraces, one of their chief objections to conservation plans is minimized. Consequently, it is expected that more farmers than previously will follow the plans.

Most farmers will be able to conserve their soil without changing to a high-forage rotation and to livestock that can use this new combination of forage and grain profitably. The required change in farm organization will be less than under the earlier conservation plans; the decrease in immediate net farm income will not be as large; and subsequent increases in farm income are likely to occur sooner.

The vegetative conservation plan that was developed for each farm in 1949 also has been revised. But little change was made in these plans, because research found only minor changes in the effect of forages in controlling erosion. The 1949 high-forage plans called for row crops on an average of 18 percent of the tillable land on the farms. However, from 1949 through 1952, an average of 42 percent of land that could be cultivated was in row crops.

The revised plans for all the farms increase the recommended row crops to 21 percent of the tillable acres. Most of the increase in row crops would be on the most level land. On the roughest land, the acreage of row crops recommended in the 1957 plan is slightly less than was recommended in the 1949 plan.

The past studies of obstacles to control of soil erosion indicated that the greatest soil loss occurred on the roughest land. As the plan favoring mechanical practices now allows considerably more row crops, particularly corn, on the rougher land, it is more likely to be accepted by the farm operators. Many farmers may still object to the high-forage rotation plan. However, the changes in the mechanical practices permitting more row crops will probably cause many farmers to adopt this practice, and thereby erosion in the area will be reduced materially.

In the survey currently underway, emphasis will be placed on investigating methods of getting terraces accepted and installed. Apparently, terracing is the most satisfactory method of controlling erosion without having to shift to high-forage rotations. Further inquiry will also be made into ways of overcoming other economic obstacles to control of soil erosion.

The Waupaca Story

By W. H. LATHROP

JOHN NIMLOS claims to be the Service's laziest man. He thinks no one else has it so good. Each morning he walks a leisurely three blocks to his office in the county courthouse at Waupaca, Wis. A casual acquaintance on the street is just as likely to ask about the progress of the soil conservation program as he is to comment on the weather.

And, work unit conservationist Nimlos's technical service to the Waupaca County Soil Conservation District is as orderly as the office itself. Conservation aid, Al Holly and soil conservationist, Herb Tauchen start the day's work with seemingly few instructions. For phone inquiries about the district, Nimlos is likely to refer the caller to the farmer or businessman in charge of that particular activity. For the farmers concerned, in the Waupaca district, with the help of business and civic leaders, are running their own soil conservation program.

The "Waupaca story" is becoming legendary in Wisconsin. Metropolitan newspapers rewrite it periodically. Farm magazines have printed articles, and radio and TV stations have broadcast events and interviewed personalities connected with it.

What makes things click in the Waupaca district? Few people agree exactly. To understand it you have to meet John Nimlos and leaders like Milton Solberg, president of the Waupaca County Bankers Association, and Alfred Mellen, president of the Waupaca County Farm Improvement Association. You have to visit with Art Smith, unofficial dean of the Bankers Award program, or meet some of the other leaders of the county.

Nimlos was assigned to work with the Waupaca district shortly after it was organized in 1944. But even before that he had dreamed of working in a community where everyone would know about the soil conservation program and would solidly back the district and its activities. Would Waupaca be such a community?

There was a lot of interest right from the start in erosion problems and miscellaneous practices to correct them. There were a lot of

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

Township winners of the first annual Bankers Award Program in Waupaca County.

phone calls, a lot of meetings, and a lot of requests to run here and there to do a lot of things that didn't seem to add up to a soil conservation program.

"Right there", says Nimlos, "is where I started getting lazy." He just didn't have time to do all those things and still promote the kind of community program he had dreamed about. He discussed the problem with county agent Mike Drozd. Mike was enthusiastic and cooperative, but he too had a tremendous number of errands to run.

The goal for the Waupaca district the first year, 1945, was 25 farm plans. The number of plans written was 25. The goal was doubled for 1951. Nimlos met it with exactly 50 plans. In the meantime, he was visiting farmers and businessmen. He told them and everyone else willing to listen what a community, working solidly for soil conservation, could accomplish.

Just what elements made the Waupaca program possible are hard to assay. There was a natural interest in conservation. Farmers and businessmen were progressive and cooperative. The County Bankers Association was particularly interested in farm problems. A great many Waupaca County farmers were members of the Holstein-Fresian Association, which had carried out public-minded projects. But most of all there was a spirit of public interest and responsibility.

Take Alfred Mellen, for example. Alfred farms 160 acres near Weyauwega. Along a lake that borders his farm, he has developed what is virtually a public park that he maintains at his own expense. Being an expert wood craftsman, he built a houseboat large enough to accommodate 50 people. It is used by public groups for meetings. Multiply Alfred Mellen by about one hundred and you're ready to explain the success of the Waupaca County Farm Improvement Association and Bankers Award programs.

Since the Improvement Association was organized in 1948, its accomplishments have been many and varied. It has run test plots on fertilizers and corn maturity. It has held meetings to help the county agent with his extension program. It has twice cooperated with the State Field Day and Plowing Matches by providing a dairy bar, wagon trains, and men for clean-up

Mr. and Mrs. Jesse Sannes, twice winners of a township Bankers Award, harvesting oats on a stripcropped field.

work. It has held a family picnic annually since 1950. And each year it furnishes the judges for the Bankers Award Program.

The Bankers Award for progress in farm improvement dates from 1950, but it was not until 1953 that the present system of judging was used. Nimlos believes this system, under which farmers themselves do the judging on others' farms, is the key to the success of the program. The judging takes several days and generates much community spirit and enthusiasm. Its object is to select in each township the farmer and wife team that has made the most progress in farm improvement during the year.

The judges also work as farmer and wife teams and are assigned territories so that they will not judge personal friends or relatives. "We may get into a situation," chuckled Nimlos, "when everyone in the county will be a personal friend of everyone else with no one left to be judges."

A qualification for the winning team is that they must have a conservation farm plan and follow it. Although the judges have a score card, they do not score entirely by points. They consider social activities, public offices held, and work with cooperatives. Each year a county winner is selected from the township winners by the past county winners and the soil conservation district board.

Culmination of the award program is the annual Bankers Association banquet for the winning farmer and wife teams. This is an elaborate social event that lasts from noon to 3 or 4 p.m. It is held at various locations throughout the county.

Under an unusual provision of Wisconsin law, when a soil conservation district is organized the agricultural committee of the county board becomes the governing body. Since Waupaca has a 10-man committee, it's probably the only soil conservation district in the United States with a 10-man governing body. Since 1950, the county board has spent more than $50,000 on heavy equipment for soil conservation work. Included in the equipment are 3 road patrols on which soil conservation jobs have first priority.

Alfred Mellen, president of Waupaca County Farm Improvement Association, at work.

Applications for farm plans are coming faster than they can be handled. The limit on progress of soil conservation work, according to Nimlos, is soil-survey work, machinery, and technical supervision.

It is particularly fitting that a Waupaca County Soil Conservation District cooperator should win Wisconsin's first soil conservation speaking contest in 1956. In his remarks, first place winner Stewart Huber expressed the spirit of the people of Waupaca County when he said, "If America is to live and grow, we must cherish our resources as the breath of life, and pray humbly with Kipling; 'Lord God of Hosts be with us yet, lest we forget, lest we forget'."

New Style Plantation

A Young Man Forsakes an Intended Medical Career To Operate a Large-scale Dairy and Poultry Farm, the Conservation Way.

By BARRINGTON KING

OPERATING a 325-cow dairy farm is a bigtime undertaking. Throw in 6,000 laying hens as a sideline and any farmer would have his hands full. But that's the set up on Melville Farms, operated by Robert Scott, 27-year-old son of U. S. Senator W. Kerr Scott of North Carolina.

Robert Scott didn't intend to be a farmer. He started out to study medicine at Duke University. It was not until he had 2 years of premedical work that he decided to make farming a career. So he transferred to North Carolina State College and took his agricultural course there.

Farming is a tradition in the Scott family. So sentiment probably was a factor in the decision. But keeping 2,200 acres of rolling land productive—and making it pay—takes more than sentiment. It takes a sound knowledge of agriculture and plenty of business ability.

Successful operation of the various phases of the farming program takes a lot of specialized help, too. Soil Conservation Service technicians assigned to two local soil conservation districts provided technical aid in workng out conservaton programs. The Haw River District furnished this service for 1,500 acres in Alamance County, and the Neuse River District serviced the remaining 700 acres in adjoining Orange County.

Scott, his wife, and twin daughters live on the 1,500-acre "home place" at Haw River. One room, furnished with desk, typewriter, and filing cabinets, serves as the farm office. There

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.

Scott keeps the farm records, types his business letters, and directs operations of Melville Farms.

It seems like a pretty big job for a 27-year old farmer, especially when you subtract 2 years spent in the Army overseas. And, it makes more impressive a certificate that was presented to Robert Scott by the Junior Chamber of Commerce of Burlington Community, "In recognition of his accompilshments in agriculture and his contribution to the communty."

Modest, unassumng Robert Scott gives full credit to his herdsmen, poultrymen, and other specialized employees for the smooth-running operations at Melville Farms. He's enthusiastic, for example, over the accomplishment of Houk Tester, who has charge of a 35-cow dairy herd.

Houk, a local mountain boy, has brought the production of his herd from an average of 7,300 pounds of milk per cow up to 10,000 pounds. Another 100-cow herd has come up from 7,200 to 8,400 pounds.

These figures may not seem so outstanding in some of the older dairying sections, but in the "old cotton and tobacco" South, which is still importing a good part of its milk, these records are something for a farmer to shoot at.

When we visited Melville Farms in late February, the 450 acres of fescue, orchardgrass, and ladino clover pastures were already showing signs of early spring growth. Scott explained that fescue is excellent for young cattle and gives more grazing in spring and fall. But the dairy cows seem to prefer orchardgrass, he said.

In addition to 450 acres of pasture and 120 acres of alfalfa for hay, he puts up 900 tons of silage. This is chiefly corn silage, but some small grain is used. They grow about 175 acres of corn and 300 acres of small grain, mainly oats, on the farms.

The conservation program includes the construction of seven farm ponds, located so as to be readily available to the various pastures. Plenty of water and shade keeps milk production up during the summer months, Scott explains.

The farms are equipped for irrigation, too, but with the conservation rotations that are followed on all the land, they haven't had to irrigate during the severe droughts of the past several years. The rotations include corn, small grain, and lespedeza, followed by 2 or 3 years of pasture or alfalfa.

Robert Scott serving as a farmhand on his 2,200-acre dairy and poultry farm.

Robert Scott studying the possibilities of fishing in one of his farm ponds.

The ponds are also stocked with bass and bluegill. An incidental item of farm income last year was $75 taken in for fishing permits at 50 cents a day.

Milk is marketed through a local cooperative. Eggs from the 6,000 white leghorn layers are sold directly to chainstores in cartons marked, "Melville Farms Eggs." The sale price is based on the Raleigh market, plus 8 cents for grading and packaging.

"The chainstores are anxious to get locally produced eggs if they can count on a dependable supply the year around," Scott points out.

The hens are kept confined in houses. Production averages about 70 percent. Scott keeps exact records of costs, sales, losses, depreciation, and so on.

Average useful life of the hens is about 12 to 14 months, he says. About 4,000 baby chicks are bought each year as replacements. They use chicks bred for production, which cost 40 to 60 cents apiece. The farm follows a strict program of disease control, including vaccination, and sanitary measures. They have never had any serious outbreaks of disease.

Around 700 of the 2,200 acres of farmland is in woods, mostly hardwood. Like other farmers in the South, Scott says, they're giving more and more attention to good woodland management as a part of the overall farm program.

As hardwood species are harvested, they're replanting the land to fast-growing pines. The harvested timber provides lumber for farm buildings. Scott is planning this year to put one pasture area in trees for the Soil Bank.

At one time the farms also produced hogs, sheep, and ponies. Senator Scott developed a bacon-type hog, red with a white band, known as the Melville Farms breed. However, when the Health Department recommended that they get rid of hogs to control brucellosis, the hogs were turned over to North Carolina State College for further production.

Dogs killed so many of the sheep that they finally got rid of the sheep. And ponies were eliminated to provide more pasture for the cattle. Now they are concentrating on dairy cows and poultry: the two go together very well.

"Even if we just broke even on the poultry," Scott says, "we would still be ahead of the game, because of the manure we get. The extra income going to our farm families for the extra jobs the poultry enterprise provides raises their standard of living."

A shower had come up when we reached the farm office. Soon the rain was falling in torrents. We looked out over the green fields and pastures where the grasses and clover were soaking up the raindrops as they fell.

"There are two times when you really appreciate soil conservation," Scott commented. "This is one of them. The other is during the summer droughts like we've been having for the past few years. The water we're storing in the land now will be a big help in the hot, dry weather we'll get later this year."

Robert Scott would have made a good doctor. His calm, confident but unassuming manner would have fit the profession well. But it fits the profession of farming, too. In fact, it's the quality that inspires the teamwork at Melville Farms. It's the ingredient that makes the smooth-working organization click.

GOODYEAR AWARDS.—Soil conservation district supervisors can now earn up to 500 additional points for activities in "soil and water conservation appreciation programs for young people" according to the rules and scorecard for Goodyear's fifth nationwide Soil Conservation Awards Program that ends on April 30, 1958.

It Doesn't Cost

A Delaware Farmer Increases His Output by 50 Percent Through Drainage, Fertilizing, Liming, Crop Rotation, Cover Cropping, Stubble Mulching, and Other Good Conservation Practices.

By FREDERICK T. MOTT

"CONSERVATION farming doesn't cost—it pays," Kurt Schettler of Clayton, Del., tells you. It has paid him by increasing his farm output at least 50 percent.

Kurt faced many problems when he took over his 296-acre farm years ago. He soon learned that he had some poorly drained land as well as some very good land. The wet areas were scattered all over the farm. They gave him trouble all the time. He noticed also that wind and rain erosion and soil-fertility depletion were stealthy thieves.

Schettler pondered how best to solve his conservation problems. To tackle his drainage problem he spent a lot of money and hard labor to lay about 3,000 feet of tile. Then he found that this didn't do the job as well as he had hoped. He was discouraged, but recognized the need for more and better planning.

Note:—The author is work unit conservationist, Soil Conservation Service, Dover, Del.

His neighbors directed him to the Kent Soil Conservation District office. When Kurt went there in October 1949, he says he didn't expect to get much help. But the district supervisors immediately made available to him the services of SCS technicians. He found these technicians were not only ready to help him with his conservation problems but had the tools to do it.

The first job the technicians tackled was to make a soils map of the farm. The map showed there are eight different types of soils on Kurt's farm, although his land is all relatively flat. A considerable acreage of well-drained Sassafras loam and sandy loam are Kurt's best land. There are several acres of Woodstown loam and sandy loam soils, which are neither well nor poorly drained. Here and there are the poorly-drained Fallsington loam, sandy loam, and Othello silt loam soils. The SCS men had found by experience that surface drainage would give the best results on these latter soils.

Mrs. Kurt Schettler and Frederick T. Mott observe the crowns of the bedding system installed on wet areas of the Schettler farm.

Kurt Schettler harvesting soybeans.

The technicians figured how big and how deep his ditches must be and what grade he could expect to get on this relatively flat land. Kurt got these answers, as well as an estimated cost, before he decided where to begin and how much to do.

Through the soil conservation district Kurt got the use of the heavy equipment needed to do the ditching. The Agricultural Conservation Program refunded him about half the cost of his ditch digging.

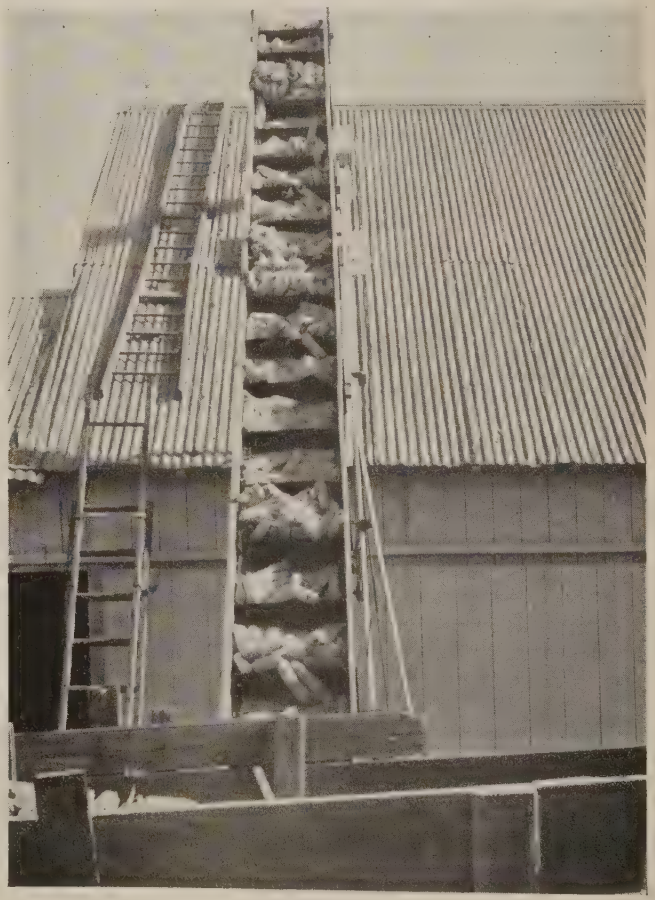
Kurt dug U-shaped outlet ditches. He knew that in some soils these ditches would not drain areas more than a few feet away; so, he laid out a system of field ditches where the wet areas would be plowed in plots about 100 feet wide. He crowned the center with a back furrow and formed a series of V-shaped ditches between the plots with dead furrows. These plots extend at right angles to the bigger outlet ditches; the dead furrows drain into the outlets. Over a period of years Kurt has developed many acres in this manner with his plow and a small terracer, which he bought to maintain his drainage system.

Today, there are more than 3 miles of ditching on his farm. Kurt says that every foot of ditch has paid for itself in 2 years or less.

Schettler, a lifelong farmer, who came from Germany in 1930, expects every acre to produce. He knows it will if it is used and treated right. Through his conservation efforts he has built up his yields to 95 bushels of corn and 35 to 40 bushels of soybeans per acre. He even gets 35 bushels of wheat an acre on land that was once too wet to grow any kind of grain.

Kurt is quick to point out that drainage alone has not brought all these gains. As part of his overall conservation program, he rotates his crops, and fertilizes and limes his soil by test. He limes each field every 3 or 4 years. For planting and topdressing corn he uses up to 700 pounds of commercial fertilizer per acre. He uses about 300 pounds of fertilizer on h s soybeans and 600 pounds on his small grain.

This conservation farmer doesn't like to invite erosion by letting his land lie bare during the winter, nor does he like to see his cornstalks standing and housing corn borers throughout the winter. He disks the cornstalk residue, as well as the soybean residue, into the top few inches of soil. The disked residue decomposes quicker than if plowed under; it also acts as a mulch for his cover crop of ryegrass or rye. He plans that once he gets his lands drained he will sow a crimson clover-ryegrass cover crop at the last cultivation in his corn



Corn elevator in operation on the Schettler farm.

SCS technician examines soil of a stubble-mulched cornfield on the Schettler farm.

or soybean crops. He figures the extra amount of root growth from this legume-grass combination will help build up his soil structure.

By improving his farm at least 50 percent with his soil conservation program, Kurt has been able to farm more efficiently and raise the crops of his choice for nearby markets. His increased production has enabled him to invest in the modern machinery needed. He now has four tractors of various sizes, a combine, corn picker, elevators, several wagons, rotary hoe, mower, plows, drill, and other accessories. With this modern equipment Kurt and his wife do most of the work on the 296-acre farm.

FARM EXPORTS AT RECORD HIGH.—U. S. exports of agricultural commodities in 1956 attained all time highs in both quantity and value. The 1956 value of $4,158 million surpassed the previous record of $4,093 million set in 1919 and the post World War II high of $4,040 million in 1951.

A DYNAMIC NATIONAL PROGRAM of research, education, technical assistance, and where needed, cost sharing in soil and water conservation is one of the basic necessities of American agriculture.

—EZRA TAFT BENSON,
Secretary of Agriculture

One Man's Farm – – Another Man's Highway

By JOHN M. CROSS

A historic Sand Mountain farm has been swallowed by "progress." The farm on which the first steam-driven cotton gin in central Marshall County, Ala., was located has ceased to be. It is now a bustling four-lane highway bordered by a filling station, a drive-in theater, and several modern homes.

All that Albert E. Patterson now owns of his former productive 40-acre dairy farm is enough land for a home, a filling station, and a broiler house. "Progress" got the rest.

To begin with, a four-lane highway took 7.3 acres right out of the middle of Patterson's farm. This ruined his pasture system and with it went his dairy business.

Because the highway ran between his home and 12.6 acres of his best pasture, he sold that part of his farm for homesites. He built a filling station on 1½ acres and sold off another corner of his farm for a drive-in theatre.

Mr. Patterson bought the farm in 1927. It had been previously owned by a pioneer farmer —W. A. Darnell—who moved to it from Butts County, Ga., in 1873.

Note:—The author is work unit conservationist, Soil Conservation Service, Guntersville, Ala.

The former dairy farm of Albert E. Patterson.

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Mr. Darnell was one of those strong believers in nature's fertilizer—barnyard manure. A news item in the April 22, 1882, issue of the Guntersville *Democrat* reported that Darnell produced over a bale of cotton per acre.

Albert Patterson agreed with Mr. Darnell on the virtues of manure. He put all of the manure from his dairy herd back on the land, but he used commercial fertilizer also.

The worst crop of cotton he ever made on the place was 28 bales on 25 acres. That was with plenty of barnyard manure and 1,200 pounds of commercial fertilizer.

In 1939, the last year it was in cotton, 57 years after Darnell's record yield, the land was still good. Patterson planted 5.2 acres to cotton, put down 600 pounds of 6-8-4 fertilizer, and his annual application of barnyard manure. He side-dressed the area with 300 pounds of fertilizer. He picked 14 bales from the 5.2 acres. Since then the land has been in grass and legumes for pasture and hay.

The land would have gone on making good yields, because Mr. Patterson had a good water-disposal system on it and was still careful to keep the soil's organic content high. But, he is in the filling station business now, and his neighbors have suburban homes near a four-lane highway.

Land with a record of high yields grows no better filling stations, highways, or outdoor theatres than poor, eroded land, but "progress" makes no allowance for that.

DOOR PRIZE.—A. M. Weaver, of Portland, Ore., recently received a subscription to SOIL CONSERVATION Magazine as a door prize for attending a regular meeting of the Kiwanis Club. The subscription was given by Paul E. Lemmon, soil scientist, SCS, whose background and work was featured that day on the Kiwanis program. According to a custom of the club, the member whose work is featured at a meeting provides the door prize.

SOIL THAT MOVED.—This is a story of soil that left the farms but didn't blow or wash away.

The farmers sent or took it. They know—with satisfaction—exactly where it is. It's now a part of the landscaped grounds at the new headquarters building of Consumers Cooperative Association in Kansas City, Mo.

It's there, doing its part to feed and support the new trees, shrubs, flowers, and lawn; in effect, a symbol of the regionwide ownership of the cooperative.

There is soil from how many farms? Nobody can really say, because, despite the best of intentions, it became impossible to keep track.

The story began last fall with the meeting of the Missouri State Soil Districts Commission at Liberty, Mo. Only a few miles away, on the north bluff of the Missouri River, overlooking the Kansas Citys, the new headquarters building of the regional cooperative w[as] nearing completion. In appreciation of CCA's helping sponsor their meeting, the conservation leaders brou[ght] 32 samples of soil to be spread upon its new grou[nds] a sample from each of the State's 32 soil districts.

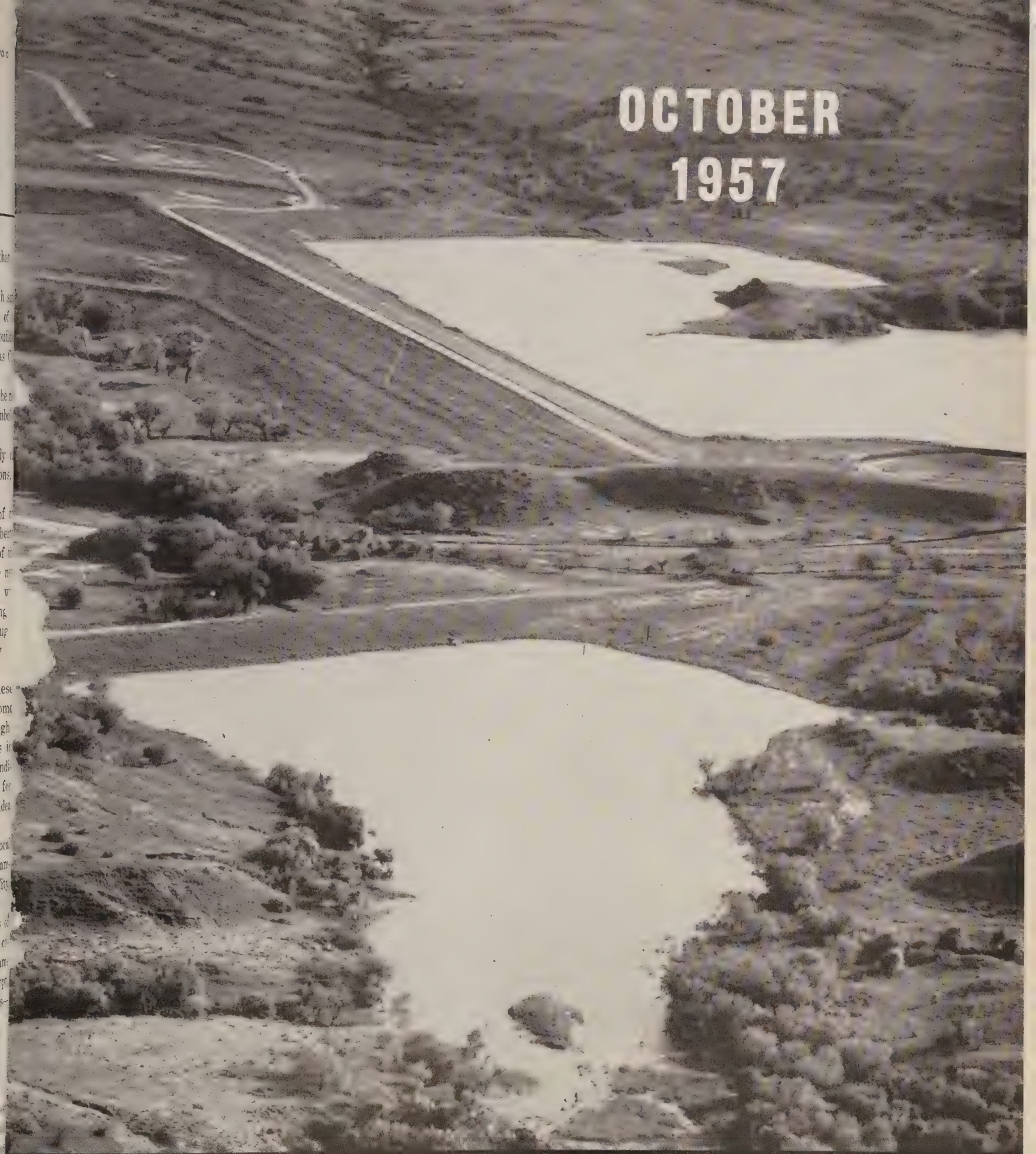
The president of CCA soon afterward reported these activities to the CCA board, whose 21 members com[e] from 8 States. Several of the board members though[t] at once that some of the soil conservation districts in their States—not to mention the cooperatives and individual farmers—also would like to contribute soil for the regional co-op's grounds. And from there the idea grew and spread.

Farmers individually or as representatives of local cooperatives or soil conservation districts brought samples of soil to CCA's annual meeting in Kansas City. Many others sent them.

From within the region there were contributions of soil from 180 or more soil conservation districts, cooperatives, and individuals. Contributions also came from 15 States and from Canada, Great Britain, Egypt, Israel, the Scandinavian countries, and many others—18 Nations, in all.

SOIL CONSERVATION DISTRICTS are the best mechanism ever devised in this country by which farmers may carry out their own programs—such as soil conservation—in cooperation with government but without being dominated by government.

—D. A. WILLIAMS, *Administrator, Soil Conservation Service*



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SECRETARY OF AGRICULTURE

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

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MULTIFLORA ROSE.—A satisfied district cooperator recently wrote the SCS office at Danbury, Conn., as follows:

"About 10 years ago you made a survey of my farm. Among the recommendations you made was one that I convert a long, narrow field into a pasture. The Still River formed a natural boundary on one side and the opposite side, almost half a mile long, was bounded by Town Road. Along that side you recommended planting multiflora roses and various government agencies furnished me 1,000 or more small plants.

"I frankly had very little confidence that these plants would form a barrier for my Angus cattle. However, the project has been a complete success and I thought you would like to know it."

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Floodwater-detention dams in the Sandstone Creek Watershed, Okla., after heavy spring rains of 1957. The creek stayed within its banks, though nearby streams were flooding.

—Photo by Robert B. Branstead

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Under All Is The Land

A County That Is Rapidly Being Urbanized Uses Its Recent Soil Survey for Planning Suburban Development, as Well as for Conservation Farm Planning.

By TOM DALE

TOM JOHNSON, a retired Government worker, decided to supplement his meager income by raising some vegetables in his back yard. He had almost half an acre of fairly level ground behind the new home he had purchased recently. The surface soil was a reddish-brown color and looked as if it might be very fertile. But when Tom tried to plow the ground he found the soil to be a soggy clay that was impossible to cultivate. Too early in the spring, he thought! He waited a month, then after a 2 week's drought, tried again. It was still soggy wet with a trickle of water oozing off the surface onto his neighbor's backyard.

He called the county agent for advice. A few days later the county agent came by, took one look at the seepy yard, and said: "I see your septic tank is giving you trouble. They nearly all do in soil of this kind."

Johnson wanted to know what he could do about it. The county agent couldn't give much encouragement. Johnson could enlarge his septic tank disposal field at a cost of a few hundred dollars; but, that would help only slightly, because the subsoil was practically impervious. The home was so far away from existing water mains and sewer lines that it might be years before city-type sewage disposal would be practical.

In the meantime, Tom and his neighbors must live with a sewage disposal field on the surface of their backyards. The stench may be pretty strong during hot summer days. The unsanitary conditions are obvious. But all the county health department could recommend was that Tom and his neighbors use less water in their kitchens, laundries, and bathrooms.

Then, there is the case of Max Bader. He bought a home in a new development on the flood plain of a small creek. The realtor who sold him the home assured him, truthfully, that the area hadn't flooded in 20 years. But Bader's basement was filled with muddy floodwater the first spring after he moved into the house. He was angry, and the realtor was perplexed. They hadn't taken into consideration the fact that hundreds of new homes had been built in the creek watershed, during the past year. All of the shingled roofs, the bare yards with their heavy clay soils, and the paved streets shed runoff water into the creek as rapidly as the rain fell. So, the creek flooded the area for the first time in more than 20 years; and it continues to do so with each heavy rain.

That was the beginning of Tom Johnson's and Max Bader's education about how soils may affect the suburbanites. They were former city dwellers who wanted to get away from the hustle and bustle, yet remain within commuting distance of a big city. They lived in Fairfax County, Va., only 10 to 20 miles from Washington, D. C.

Johnson and Bader were among the vanguard, who led the postwar rush away from the big cities to the suburbs. They moved farther and faster than water mains and sewer lines could be constructed. They tried to solve their sanitary problems with wells, electric pumps, septic tanks, and other improvisations. Many succeeded in doing so; some because they were lucky; a few because they knew about the soil on which they were building. But many, like Johnson and Bader, found they couldn't have the pleasures of country living and the modern conveniences of the city, because the land on which they built their homes was not suitable for suburban development.

Joe Beard, Fairfax County agent, points to septic tank spreading field in impermeable soil.

There are thousands of other suburbanites in Fairfax County who have had similar experiences; in fact, there are more than 2,300 septic tanks like Tom Johnson's. The population of this county has grown from 40,000 in 1940, to 185,000 in 1957. The county government budget increased from $600,000 in 1940, to $22,000,000 in 1957. The board of education must build 200 new classrooms each year to provide minimum facilities for the crop of schoolchildren that materializes annually. In other words, Fairfax County is one of the areas that has been feeling the full impact of the suburban movement during the past decade. The growing pains have been severe at times, and there seems to be no letup in the growth process in the immediate future.

Yet, Fairfax County cannot be considered an exception. There are hundreds of other counties in the United States that have been having similar growing pains, to a greater or lesser extent. Montgomery, Prince Georges, Baltimore, and Howard Counties, Md.; Suffolk, Norfolk, and Middlesex Counties, Mass.; Wayne, McComb. and Oakland Counties, Mich.; Bergen, Essex, Union, and Camden Counties, N. J.; dozens of counties in Ohio and Pennsylvania, and a hundred or more in the Midwest, Southeast, Southwest, and along the Pacific Coast; all are undergoing the transformation from rural to suburban to urban areas.

The main distinction Fairfax County can claim is that county officials have recognized that the suburban and urban developments of their county must be based on the same land that formerly supported an almost wholly agricultural economy. It is not just a matter of having suitable soil for septic tanks. The foundation base for buildings, streets and highways, and other structures is the soil or the parent material lying under it. The growth and well-being of lawns, ornamental shrubs, and trees are largely dependent on the original soil of the planting sites. The runoff from heavy rains that may tax storm sewer facilities or cause flooded basements is greatly affected by the soil type on which the rain or snow falls. The value of any property, whether it be a farm, a suburban home, a factory, shopping center, or paved highway is determined to some extent by the character of the land on which it rests.

Suburban home owners are not the only ones who suffer from building on unsuitable soil. The architects, engineers, boards of education, and even the real estate salesmen also have made grievous mistakes. In Fairfax County, the board of education acquired a tract of land for a new school building without having a proper knowledge of the soil conditions. After the school was started they found that the soil was unstable. It cost the county more than $200.000 to stabilize the footings of the building. A later soil survey showed that the building could have been located a few hundred yards away without the extra cost of abnormally large, reinforced concrete footings.

Road builders have met with many failures because they didn't analyze properly the type of soil on which they were building. Builders of suburban shopping centers have also had some sad experiences. Yet, it is a relatively simple matter for an experienced soil scientist, with proper equipment, to determine the capabilities of any type of soil—whether for farming, road building, septic tank disposal, foundations for large buildings, underground utilities, or other uses.

Why have so many people failed to consider the soil on which they were building? Most progressive farmers know that you must consider the capabilities of the soil in farming operations. They plan accordingly. But too many of us seem to think that soil type is something that only a farmer needs to take into account. Soil is soil; only the location matters! Pick out a location that suits you, then buy a lot and build there, has been the procedure all too often. Some were lucky while following this formula. Others were greatly disappointed.

Joe Beard, the agricultural agent of Fairfax County, recognized the need for a detailed soil survey as early as 1938. He requested a survey for the entire county at that time. He was thinking mainly in terms of farm planning. He did not realize that the postwar-urbanization movement was going to sweep across half of his county within less than 20 years. He didn't get the survey then but he kept the matter in mind all through his service in the armed forces during World War II. He returned to his old job in Fairfax County in 1946.

Soon thereafter, the county hired a firm of planning consultants from New York to help develop a master plan for the county. Among other recommendations, the consultants urged a detailed soil survey for suburban planning as well as for farm planning.

Soil surveys were being made by Soil Conservation Service soil scientists on many farms cooperating with the Northern Virginia Soil Conservation District. But this piecemeal survey work was not adequate for county planning. The 1938 request for a new soil survey still lay in the files of the State experiment station. In the meantime, suburban developments were encroaching at an accelerating rate across the county. It was during this period that Tom Johnson, Max Bader, the board of education, and thousands of others had their sad experiences.

By 1951, the county planning commission and board of supervisors realized that a detailed soil survey would greatly simplify their planning and zoning problems. The county health officer also became interested, mainly because of the sanitation problems resulting from such septic tanks as that of Tom Johnson. It was then that Verlin W. Smith, a member of the Zoning Appeals Board and a civic leader, teamed up with Joe Beard to try to push the soil survey.

Smith and Beard began to badger the Soil Conservation Service and State experiment station for action on the 1938 request. Both the SCS and experiment station were reluctant to commit a large amount of their limited funds for a survey in a county that was rapidly becoming urbanized. Many other rich agricultural counties also were insisting on early priority for badly needed soil surveys.

After much persuasion Smith and Beard got

Flood plains of small streams are frequently developed as suburban homesites because the initial grading of such lands is less expensive.

the Federal and State agencies to agree to budget a small sum for soil survey work in Fairfax County. But it would have taken 5 or 6 years to complete the survey at the rate these agencies were willing to allocate funds. That was too long. The county planning commission and board of supervisors wanted to make a comprehensive plan for the continuing rapid growth predicted by planning consultants. They didn't want their county to just grow like "Topsy"; and that is largely the way it had been growing. They figured that a sound plan should be based on the land, according to what each tract was suited for. The director of public works and the tax assessor also became interested.

With the backing of other county agencies, and the supervisors of the Northern Virginia Soil Conservation District, Smith and Beard made a plea to the board of county supervisors, the group that controls county finances. They asked the supervisors to allocate $15,000 each year for 2½ years to complete the soil survey. The supervisors agreed, and early in 1953 the survey was started.

H. C. Porter, a joint employee of SCS and the State experiment station, was the survey party leader. He was assisted by 3 to 5 other soil scientists, as available. More than 300 square miles of the county were surveyed, acre by acre, patch by patch, and farm by farm, according to the most recent standards of the national soil survey. And, while making the survey, Porter and his crew spent many hours at educational meetings with local groups, such as citizens associations, farmers, garden clubs, PTAs, church groups, chambers of commerce, civic clubs, fiscal study groups, planning groups, and others.

C. S. Coleman, county soil scientist, looking up soil information for county citizen.

When the survey was completed, transparent overlays were made and duplicated for each sheet of the detailed soil survey map. These overlays show all pertinent soil information. A sheet of one of these overlays may be placed over a corresponding sheet of a property identification map and the soil conditions of any specific tract quickly determined. A detailed description of each soil separation, including the land capabilities for agricultural or other use, was prepared and mimeographed. Thus, any agency or person wanting to know about a specific tract of land may quickly obtain full information about the soil type and the capabilities of the land.

When the soil survey information became available, even Beard and Smith were surprised at the number and variety of users. Nearly all agencies of the county government found some uses for the information. In addition, real estate developers and numerous individuals and groups of citizens flocked to the county agent's office to get information about specific tracts of land. And, of course, the SCS technicians working with soil conservation district cooperators were relieved of further worries about getting soil survey information for conservation plans.

Beard soon found that he couldn't properly handle all requests for soil information. So, the county supervisors hired a soil scientist to devote all his time to interpreting the soil survey for the various government agencies and citizens of the county.

E. F. Henry, a soil scientist on the State experiment station staff, was hired as county soil scientist in the fall of 1955. He became the first full-time soil scientist hired wholly by a county government in the United States. For the 18 months he filled the job he was one of the busiest employees of the county govern-

About 50 percent of Fairfax County is classed as farmland; dairying is the main farm enterprise.

ment. Henry became so well known and his reputation as an interpreter of soil surveys so highly regarded that he was hired by the Federal Housing Administration in Washington, D. C., as a soil scientist. His successor, C. S. Coleman, is still one of the busiest men around the Fairfax County courthouse.

The county health officer and his assistants are among the most frequent users of soil survey information. The sanitation branch of the health department refuses to OK a septic tank site unless the soil is suitable. During the past 2 years, the soil scientist and health department have run percolation tests on more than 1,000 soil sites in the county. As a result, they know just what to expect in the way of percolation on each of the 107 different soil separations of the county.

The planning commission and zoning board frequently examine the soil map and consult the soil scientist before making decisions about zoning, whether for residential, commercial, or public uses. In some cases the zoning edicts, resulting from soil survey information, have caused temporary hardships to individuals and groups.

For example, a real estate developer bought a 100-acre tract of land from a farmer for $600 per acre. Two paved highways passed nearby; the view was good. The developer put up a temporary office building on the tract and hung out a sign advertising lots for sale. Then he went to the county courthouse for what he thought was the formality of getting his 100 acres zoned for residential development.

The developer received a rude shock when informed that the soil on nearly all the tract was utterly unsuited for septic-disposal fields. The soil was Iredell silt loam, almost impervious. The land could not be zoned either for residential or commercial development until the developer installed adequate water and sewer systems. It was 12 miles to the nearest water supply that could be called adequate. It was almost as far to the nearest site where sewage disposal was practical. The office building and sign were taken down; the 100 acres remain a rather poor pasture, worth, perhaps, $100 an acre.

The real estate developers in Fairfax County seldom make such mistakes now. They go to the soil scientist or planning commission to find out about soil suitability before they invest in land at inflated prices, regardless of whether paved roads and other attractions are close by. Home buyers in Fairfax County also consult the soil scientist. In fact, most people in Fairfax County are now soil conscious. They have been educated to the fact that the land is the base on which they must build and live.

Recently, the board of education was pressured by a group of citizens to build a schoolhouse on the fringe of their community. The soil map showed that the site was not suitable for heavy building construction. And, more important, the soil of the neighborhood was unfit for septic disposal; it could never be developed for residential purposes until expensive water and sewer systems were installed. The school was built; but it was built a half mile away, on soil that was suitable for both schoolhouses and homes.

The director of public works and the planning commission were called on to select a site for a sanitary land fill (county dump). The site was chosen; but, nearby residents told the engineer that solid rock lay only a few feet below the ground surface. The soil map indicated that the rock was a soft schist that could be easily excavated with bulldozers and other equipment owned by the county. A few test borings showed this to be true. The county dump was located at the selected site, in spite

About 25 percent of Fairfax County is weed- and brush-covered idle land, interspersed with urban and agricultural land.

of local objections, because it was the logical site according to long-range plans of the county.

The public works director also uses the soil map in planning construction of new roads or improvement of existing roads. The map shows where soil is suitable for a stable road base, and where cuts and fills can be made without undue expense. Even more important, the soil map shows where borrow pits, with soil suitable for large fills, can be located.

The tax assessor is also a frequent user of the soil survey. No longer does he consider just the location and improvements on a tract of land to determine its assessed value. The soil map is the base from which he starts. The potential productivity as farmland is of prime importance on the 50 percent of the county's land that is still farmed. About 25 percent has been urbanized, and is assessed mainly according to the value of the improvements. But, about 25 percent of the county is properly classified as idle land.

How do you assess idle land, covered with a scattering of scrub timber and brush? It brings no income to the owner. Nearly all of it, in Fairfax County, is held for speculative purposes—waiting for the urbanization development to inflate the price. The Fairfax County assessor has a formula for these lands: he assesses them mainly on soil type and location. If the soil is suitable for suburban development and the location indicates possibilities of development in the near future, the scrub timber and brushland gets a high assessment. A nearby tract, with soil unsuitable for suburban development, may get a much lower assessment.

Several other suburban counties, in various sections of the country, have up-to-date soil maps. In most instances, however, the soil maps are ignored, so far as suburban development is concerned. The maps lay in the files of local libraries or in the county agent's office, except as they are used by SCS technicians and farmers in developing conservation plans.

Much of the interest shown by Fairfax County people in soil capabilities is due to the educational work done by the soil survey crew, and later by the county soil scientists. The accessibility of the soil survey information and the availability of a soil scientist to interpret it also contribute much toward more general use. Furthermore, the fact that the county governing body was willing to pay more than half the cost of making the survey, from a tight county budget, tends to encourage county officials and others to use the survey information.

Some county officials claim that the Fairfax County government has already saved many times the cost of the survey on public structures alone. In addition, the savings and conveniences to citizens of the county have been enormous.

FUTURE OF THE SOUTHERN GREAT PLAINS

No. 28

This is the twenty-eighth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By H. H. FINNELL

THE southern Great Plains is an area of potentially great soil resources, but agriculture has not yet been adapted to the hard facts of the physical environment. Already, several false starts have been made in the agricultural development of this area.

Men go through life reacting to environment whether they are conscious of it or not. Some lessons are learned more easily than others; but, mistakes must be recognized as such, if we hope to avoid the consequences of repeating the same errors over and over. When we undertake to manipulate natural forces, what has to be done, will be done. Whether we do it intelligently may depend on how well we understand the necessities of our environment.

During the thirties, the principal effect of drought was crop failure, which, in turn, caused dust storms that attracted wide attention. When the people realized they were up against something for which they did not have a ready remedy, the newly expanded dryland farms suffered considerable outright abandonment. This was of far-reaching consequence and might have pointed toward a final permanent adjustment but for other events that intervened.

Now, during the fifties, another drought is in progress. The year 1956 was the sixth consecutive year recording less than average rainfall in the southern Great Plains. The dust storms have been comparable to those of the thirties in frequency and soil movement, but have not caused widespread land abandonment.

The striking feature of the present period is the switch from dryfarming to irrigation wherever ground water has been available for pumping.

How long we can continue to anticipate new and different consequences of drought is hard to say, but it may be constructive to appraise the land-use adjustments that prevailed in the past. Those of the nineties and "teens" meant little because at that time the full production potential of the land was not being utilized. The abandonment in the thirties of soils too shallow or too sandy for continued cultivation was a logical step. Some of this adjustment stuck; but, unforeseen conditions—favorable moisture and the wartime market—stimulated a reverse action during the 1940's.

In the southern Great Plains one of the well recognized natural features of the environment is drought. Every time this area has a severe drought someone is sure to be heard saying, innocently, that it is unprecedented in history. This is not so hard to understand when we notice that the long droughts have been spaced just about far enough apart for each to be faced by a new generation of people.

The severe droughts that normally come to the Plains are not something to be treated lightly. Each one, within recent times, has proved to be a major event affecting the course of land development. The memory of "old-timers" still living on the Plains goes back through three or four of these events. These old-time residents have a different story about the consequences of each one; but the weather records show the droughts to have been substantially alike in severity and duration.

There are understandable reasons why the actions of landholders with respect to drought have changed from time to time. During the

Note:—The author is research specialist, soil and water research division, Agricultural Research Service, U. S. Department of Agriculture, and assistant director of the Oklahoma Experiment Station, Goodwell, Okla. From 1934-42 he was regional director of the Soil Conservation Service for the southern Great Plains.

nineties and "teens" the principal effect of drought was a shortage of grass, since not much cultivation was being done on the Plains then.

These droughts were acutely felt by heavily stocked cattlemen, and some consolidation of range holdings took place. This was not a far-reaching movement, however, because exploration of the land by small farmers was already in progress.

Experience proved that the dryfarming expansion of the twenties was not so much overdone as it was misdirected. The settlers did not use sufficient discrimination in their choice of land for tillage. In other words, they plowed considerable land that was not suitable for cultivation while leaving some cultivable land in grass.

The same indiscriminate kind of expansion took place in the forties, when nearly 6 million acres of marginal and submarginal land were put into cultivation (mostly in eastern Colorado, New Mexico, and western Texas; and, to a lesser extent, in western Kansas and Oklahoma). Compared with the plowup of the twenties this expansion was both overdone and misdirected.

The drought-triggered readjustment in progress now is two pronged. Along the arid margin of the Plains considerable abandonment of low capability land is taking place. In the marginal zone, the most ambitious effort to meet the drought situation has been to develop irrigation by pumping from wells.

Land abandonment was a common feature of the dust bowl of the 1930's.

The southern Great Plains have long been recognized by agriculturists as a broad belt of territory that has greater soil productivity than that of the natural moisture supply.

To the dryland farmer this presented the inviting prospect of reward for efficiency in water management. During the twenties, farmers and soil scientists alike were fired with enthusiasm by the quest for practical water conservation methods. Even in this early stage of dryfarming development, wheat production was such to encourage the spilling over of land settlement into the marginal zone along the arid western fringes of the Plains.

The drought of the thirties was a normal change but it caught the farmers unprepared for the problems of wind erosion. The consequences are well remembered as the "dust bowl" experience of the "dirty thirties." A land-use adjustment was made then to suit the hard necessities of natural conditions. Soil deterioration and the abandonment of cultivation were more prevalent on low capability lands in the marginal zone. Likewise, it was there that recovery was most spectacular during the normal turn toward a more favorable run of seasons in the forties.

Easing the strain of trying to maintain precautions against dust storms not only restored the land boom attitude but the wartime market enabled many of both the older and newer settlers to pay off their mortgages. This clearing the land of obligations came just in time to make way for the new venture of investment in irrigation wells.

Well pumping for field-crop irrigation has been practiced in shallow water areas of the southern Plains country for nearly half a century. The drought of the thirties stimulated expansion of irrigation into adjacent, not so shallow, areas. When drought again threatened early in the fifties a further extension of well-pump irrigation started in deep-water areas.

Until now the lowering of the water table, as the deposit of ground water was gradually pumped, has been offset by new, more efficient pumping equipment, by cheaper fuel for power,

Pump irrigation from underground water has been a popular method of solving the drought problem of the 1950's.

by gaining skill in the more productive use of water, and by the introduction of more valuable specialty crops. Even so, some farm-irrigation areas have lately come into fierce competition with municipalities for the use of ground water stores.

Theoretically, the ground water supply is a naturally renewable resource. However, it is an exhaustible deposit as used in the southern Great Plains. The demonstrated rate of natural recharge is so slow that we might as well treat this deposit of water as we would an oilfield, so far as irrigation agriculture is concerned.

In many irrigated counties the water table is now down 60 to 80 feet below the level at which pumping was started. This means that in some areas, as much as half of the available ground water store has already been used. It means further that the remaining supply must be lifted at least 60 to 80 feet higher to get it out of the ground.

The simple arithmetic of pump irrigation is illustrated by the situation in the Oklahoma Panhandle, where deep well irrigation is developing rapidly on a limited ground water supply. In some localities the underlying charged water sands are 100 to 150 feet thick. Water yield is 15 percent. Total available water in store is 15 to 22.5 feet.

If used at a minimum rate for supplemental irrigation of 1 foot per year on one-fourth of the land area, the total supply would last between 60 to 90 years. (Some areas have water sands up to 500 feet thick, but the cost of lift from deeper strata may become a practical limitation.) In this example, three-fourths of the land would still be subject to dryland management.

If, however, a county, or even just a community, were seeking to eliminate completely its drought problem by irrigating 100 percent of the land, it would find its ground water had disappeared in 15 to 25 years unless it could receive some inflow from neighboring undeveloped areas.

Well-pump irrigation, as either a complete or a partial solution for drought, must be recognized as only a temporary expedient in the long-time agricultural life history of the southern Great Plains.

This puts the burden of long-time production on dryland farming. It is for this reason that whatever tradition of dryland farming we have should be preserved and a special effort needs to be made to perfect the techniques of dryfarming as applied to the southern Plains. This large body of fertile soils literally has no long-time future except for dryfarming.

The limitations of water resources and their use are part of the hard facts of nature, just as are the limitations of land capability. In a dryfarming economy, conservation farming is the only thinkable starting point for a permanent agriculture. The gist of the matter is: any permanent solution must include a sharp discrimination in land use that concentrates intensive tillage on the high capability land and lets nature have her way on hard to manage lands.

The only way, apparently, to conform gracefully to the necessities of southern Plains environment, is to take the long-time viewpoint.

It's The Rain You Keep That Counts

By D. A. WILLIAMS

RAINS that broke the drought in the southern Great Plains last spring proved again that soil- and water-conservation practices help farmers and ranchers equalize the effects of climatic extremes.

Where President Eisenhower in January made a personal inspection of drought damage, farmers in May and June found their fields too wet to harvest grain or till row crops. In the lowlands downstream the Red Cross and other relief agencies ministered to flood victims.

Nevertheless, by midsummer crops in some fields were withered for want of moisture, while foliage in neighboring fields was lush and green. On many ranches, the young grass and tender weeds that had been started by the rains lay parched and brown beneath the summer sun.

Conservation treatment on the land made the difference. Cropland and pastures that were protected by plant cover or other good conservation practices readily absorbed a large part of the drought-breaking rainfall. Unprotected land, on the other hand, shed the water into streams and rivers, helping to produce an unprecedented series of damaging floods.

Alert soil conservationists in drought-conscious Texas documented the story by hundreds of moisture-penetration observations in late May. In all parts of the State, whether 1957 rainfall had amounted to 2 inches or 40, they consistently found the soil wet to greater depths in fields and pastures that had good cover or other protection than where the soil was bare or untreated.

Technicians in more than 120 work units dug holes or made borings to see how deep the soil was wet. The field checks included 133 paired observations comparing protected and unprotected land under otherwise similar conditions. Forty of the contrasting pairs were on cropland, 93 on range or pasture; 64 were in areas that had received more than 12 inches of rainfall since January 1; 69 had received from 2 to 12 inches.

In all but three cases, the land with cover or other conservation treatment was wet to greater depth than the same soil nearby without such protection. In two of these three cases, insoak was the same. The lone exception, on terraced cropland, is unexplained, but probably was due to an impermeable plowsole.

Although there was great variation in depth of penetration under the widely different soil and rainfall conditions, on the average, insoak was twice as great on protected land as on unprotected. Where rainfall exceeded 12 inches, average depth of penetration was 55 inches on protected land and 29 inches on unprotected land.

This meant that cropland or grassland with good cover or conservation treatment was wet to the full depth of the normal root zone (4 to 6 feet) wherever enough rain had fallen to wet dry soil to that depth. Bare or unprotected land, by contrast, was still dry in the lower root zone and crops or grass soon suffered where rain had not come at frequent intervals during the summer.

Twenty out of 25 fields of cropland that had received more than 12 inches of rainfall were wet to below 48 inches where protected by conservation practices, but only 11 were wet to this depth where unprotected. In 39 comparisons of rangeland, 28 of the protected areas, but only 4 of the unprotected were wet to 36 inches.

The benefits of conservation were apparent in deeper moisture penetration on all soil types examined. In fact, area conservationists who summarized the observations repeatedly com-

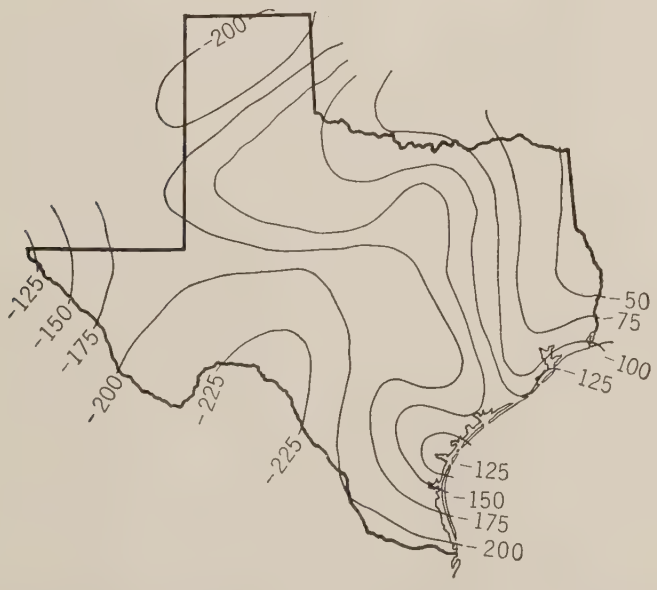
mented that cover and condition of the surface soil seemed to have more effect on the amount of water absorbed than did differences in soil types.

In 77 comparisons of land with and without cover, moisture penetration averaged about 1½ times as deep on cropland with a cover as without, and about 3 times as deep on rangeland with good cover as that with poor or no cover.

One of the unexpected findings in Texas was that cropland generally absorbed more water than rangeland. Where rainfall exceeded 12 inches, average penetration under conservation protection was 72 inches on cropland compared to 45 inches on rangeland. Without protection, the average penetration was 45 inches on cropland and 29 inches on rangeland.

We have been accustomed to thinking that grassland, simply because it is grassland, permits less runoff than cropland. But the observations in Texas indicate that the amount and *condition* of the cover can have more influence on insoak than whether the land is used for crops or pasture.

J. L. Richmond, area conservationist at San Angelo, explained it this way: "Cropland had better moisture penetration than pasture in most cases. This was due to the poor cover that was on most of the rangeland in the area. The cropland as a whole was deep-listed and contoured. This deep-listing and contour-furrowing held most of the rainfall and allowed for better penetration."



Deficiency of precipitation in Texas for 5 years (1952-56) in percentage of normal precipitation for 1 year.

Total precipitation (inches) in Texas, March through May 1957.

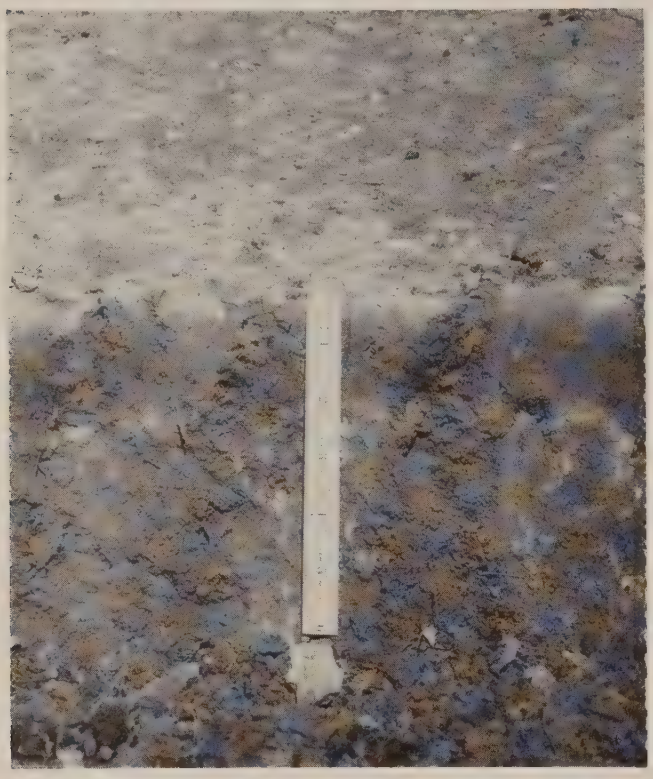
Because of the extended drought, most rangeland had only sparse cover even where it had been moderately grazed during the past 2 or 3 years. Most range soils in the southern Plains crust when the surface is exposed to rain and sun. The prevalence of this condition caused high rates of runoff from rangeland not protected by good cover or special conservation practices.

"Moisture penetration on cultivated land shows a close correlation to the amount of good conservation practices on the land." This statement by James D. Abbott, area conservationist at Lubbock, sums up the observations on cropland. He estimated that in the High Plains area, where he works, approximately 60 percent more penetration occurred where good practices were in effect than where not.

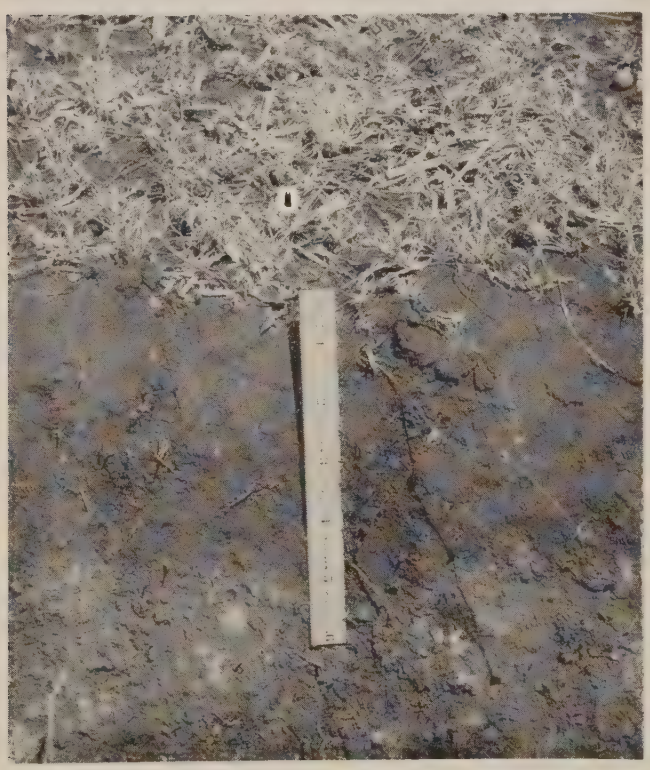
Cultivated land with a cover crop on it usually was wet 1½ to 2 times as deep as similar bare cropland. Cover also protected the land from washing during the hard rains.

"Good agronomic treatment with legumes and small grains for periods of 5 years or more without row crops has proved to be as effective as fair native grass cover for getting depth of moisture penetration," Area Conservationist, D. C. Larner of Terrell reported.

"It was very noticeable," said John W. Herring, Jr., area conservationist at Alice, "that on land that had cover there was much less damage than on land that was bare or in a row crop."



Moisture penetration from .95-inch rain on bare range (above) was 2 inches; on range with short-grass cover (below) was 5 inches.



Cropland with a mulch of stubble or residues absorbed up to twice as much moisture as land without this protection. Stubble mulch also reduced erosion.

"The management of crop residues has again proved its value in control of water erosion and wind erosion following rains," W. S. Goodlett, area conservationist at Big Spring, observed.

"Even flax stubble provided considerable aid in protecting the soil from raindrop splash," area conservationist Herring reported.

Moisture penetration was usually 1½ to 3 times as deep on terraced and contour-farmed cropland as on similar land without these practices.

Insoak was more variable on fields with these mechanical practices than where cover crops or residues were present. In one comparison, insoak was greater on the untreated than on the treated field. Soil was usually wet below the root zone where water had collected above terraces. Other studies have shown that terraces must be correctly built for moisture conservation if they are to increase water intake consistently.

Where a combination of vegetative and mechanical practices was used, treated cropland was wet 1½ to 3 times as deep as untreated land on the same kinds of soil.

Rangeland with good cover was generally wet 2 to 5 times as deep as that with poor or no cover.

After 5 to 8 years of continuous drought, range conditions in Texas had deteriorated badly, even where stocking had been drastically reduced. The "good" cover found in the moisture-penetration comparisons did not always consist of the best forage grasses by which range condition is judged. But any kind of plant growth left on the ground helps protect the soil and increase insoak of rain.

E. J. Hughes, area conservationist, at Brownwood, estimated the percent of rainfall effectively utilized varied from 10 to 90 percent.

"The amount of cover is the determining factor," he said. "We have more cover now (in May) than we have had since the early forties. Annuals dominate the landscape but are serving a purpose."

In the San Angelo area, J. L. Richmond re-

Hubam sweetclover and oats on this field held most of a 14½-inch rain that fell in 24 hours. Water did not flow through the emergency spillway of the water-retarding structure below.

ported, "The ratio of moisture penetration for rangeland in fair to good cover as compared to poor cover and bare ground is 3 or 4 to 1."

In the absence of good cover, tillage treatments of rangeland increased insoak.

Pitting and chiseling increased depth of penetration 2 to 4 times that on similar untreated land. These practices are used most in the drier range areas. The tillage breaks the crust of bare range soils, permitting storage of enough moisture from small rains to make them effective in starting plant growth.

Moisture penetration in cropland of Texas, May 1957, where paired fields were adjacent and similar except for conservation treatment.

Treatment	No. of fields	Average penetration
Cover crop	13	60 inches
No cover crop	13	35 "
Stubble mulch	6	40 "
No stubble mulch	6	28 "
Terraced and contoured	8	46 "
Not terraced or contoured	8	30 "
Combination of practices	13	75 "
No conservation practices	13	44 "
All cropland with conservation treatment	**40**	**59 "**
All cropland without conservation treatment	**40**	**36 "**

Root-plowing is used to remove worthless brush from depleted south Texas ranges. The plow consists of a long knife-like blade pulled behind a powerful crawler-type tractor. It cuts the roots of shrubs and small trees and breaks up the soil to a depth of 8 to 16 inches. Grass seed usually is planted at the same time or immediately after root-plowing.

Moisture penetration on root-plowed land was 2 to 6 times as deep as on unplowed land. Greatest insoak occurred where grass had been seeded and the root-plowed land had good cover.

Area Conservationist, John W. Herring Jr. reported observations on a ranch near Kennedy that indicated 9 inches of water stored in root-plowed land compared to 1 inch of water in untreated bare soil.

"The 9 inches of stored water under the root-plowed land will support enough vegetation this year to maintain good penetration in this pasture," he said.

Land root-plowed a year or more ago and still bare, however, generally was wet little or no deeper than untreated land. In the Uvalde area, Meril G. Carter reported, "Some freshly root-plowed land, which had 4 inches of rain, had 36 inches penetration. Some old root-plowing, which had 4 inches of rain, and had never established a cover, had 14 inches of penetration. Untreated land in the same area with the same rainfall had the same penetration."

Moisture penetration in rangeland of Texas, May 1957, where paired plots were adjacent and similar except for conservation treatment.

Treatment	No. of plots	Average penetration
Good cover	64	39 inches
Poor or no cover	64	14 "
Pitted or chiseled	9	26 "
Not pitted or chiseled	9	8 "
Root-plowed	20	35 "
Not root-plowed	20	13 "
All rangeland with good cover or treatment	**93**	**37 "**
All rangeland with poor cover or no treatment	**93**	**13 "**

These observations help to explain why farmers and ranchers who use good soil and water-conservation practices go through periods of drought with less distress than others. Their fields and pastures go into dry periods with reserves of moisture stored in the soil.

They help explain also how conservation treatments and small dams, already installed on 25 Texas watersheds at the time of last spring's rains, reduced flood damages by an estimated million dollars. In addition to the water detained by the dams, each foot of dry soil made wet by insoak had stored from 1 to 3 inches of rainfall instead of permitting it to run off over the surface. Potential flood hazards were thereby reduced accordingly.

Although land treatment was not complete above all the 173 floodwater-retarding structures that functioned on Texas streams last spring, we can be sure that soil- and water-conservation practices contributed materially to benefits reported from the subwatersheds of the Trinity and Colorado Rivers and from four pilot watersheds.

Even more important to the land owners and operators, the water held in the soil helped to grow crops, forage, and other vegetation during the rainless weeks that followed.

Conservation Cartoonist

By W. H. LATHROP

FELIX Summers, artist in the field cartographic unit, Milwaukee, Wis., recently received a Certificate of Merit and a check for $1,000, highest cash award ever given by the Soil Conservation Service.

Illustrations in ever-increasing number and variety have flowed from Felix's drawing board, but the citation took particular notice of his series of conservation cartoons and of his perseverence above and beyond the call of

Felix Summers

routine orders and office hours. The award was presented by Dr. Austin L. Patrick, at Milwaukee, where Felix is stationed with the cartographic unit.

Fellow SCS workers know Felix best for his series of humorous and philosophical cartoons that have been published throughout the United

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

States and in other countries. Many of these have been used on editorial pages and in special newspaper editions. Only recently a printed collection of his drawings was distributed throughout the Service to make them available to all field offices.

Born on an Iowa farm, Felix got his first knowledge of agriculture from the land itself and from the livestock, gullies, and buildings he likes to draw. During the depression he worked his way through the University of Nebraska's School of Fine Arts. Later, he worked on a Wyoming ranch. A scholarship from the Nebraska Art Association made it possible for him to enroll at Yale University. After his course there, he served a year's apprenticeship under muralist Eugene Savage. Then came free-lance work for nightclubs and stores.

When the war came, Felix enlisted in the Army engineers. After the war, with no immediate employment in sight, Felix returned to his old home in Mills County, Iowa. There he joined the Soil Conservation Service as conservation aid under Work Unit Conservationist, Ray Jones. His art career seemed suspended; however, he turned back to his drawing board again. In the evenings he made charts and sketches that would help sell farmers on the practices he planned with them during the day. When some of his work came to the attention of men from the regional office at Milwaukee, he was asked to join the SCS staff there in 1949.

Probably the most widely known of all Felix's drawings is the "Service emblem" which has been used in many ways, even as a postage meter cancellation stamp, and more recently as a Service employees' calling card. One of his popular cartoon series depicts two black crows who make wry comments about the conservation scene.

A PLANT LIVES IN TWO WORLDS, one above the ground surface, the other below. About half of the plant lives in each. Above ground is an environment whose factors are sunlight, temperature, moisture, wind, carbon dioxide, and oxygen, among others. The plant must be suited to these factors or it cannot flourish. If this atmospheric climate changes, plant species must change.

Below the ground surface is an environment whose factors are darkness, moisture, temperature, air, humus, microorganisms, small animals, minerals, and so on. If this soil climate changes greatly, the plant species growing in it must change. It is possible, even common, for the soil climate to change while the atmospheric climate above it does not. One factor which can easily change is moisture. Moisture gets into the soil by the infiltration of water, and the infiltration rate may change radically.

When rain falls on sloping land, it will do one or both of two things: It will soak into the soil or run off. On land that is well covered with vegetation and has a loose, porous soil, with an organic mulch, as much as 99 percent of the rainfall may soak in. Where a slope has been denuded of its porous topsoil by cultivation and continued erosion, the soakage may drop as low as 50 percent. When this happens, there is a definite change in soil climate: it becomes twice as arid. If the atmosphere supplies 20 inches of rain a year, only 50 percent of which soaks into the soil, the plants living there are no better off than if only 10 inches of rain had fallen and all of it had soaked in.

Topsoil and Civilization
TOM DALE AND VERNON G. CARTER

53,000 Jamboree Scouts discover . . .

The Magic of Conservation

By BERNHARD A. ROTH

THE sheer magic of conservation opened the eyes of 53,000 Boy Scouts and leaders at the Fourth National Jamboree during seven, dramatic July days at Valley Forge State Park, Pa. "The Great Conservo," master magician and conservationist, did his stuff, carnival style, under the Big Top, to the shrill piping of calliope music. Rabbits emerged from silk hats, trees shot up out of buckets, and conservation slogans sprang from a magic typewriter.

Then came a color movie introducing the campers to "Our Magic Land." As the film unwound, Scouts learned that even the Great Conservo had to call upon science to guard America's soil, water, forest, fish, wildlife, and mineral resources.

Outside of the tent they moved down the midway through a wonderland of conservation science in action. First, they got a worm's-eye view of soil profiles imported from New Mexico, Nebraska, Wisconsin, Georgia, and Vermont. Then they saw raindrops bouncing specks of soil a foot and a half in the air. And, grassed soil that refused to budge in the rain.

Next, they saw water roaring downhill, pulling naked soil with it, yet unable to destroy contoured furrows and vegetated slopes. In the next booth, the wind was blowing up a gale. A dust cloud hit Scouts' faces when they stood near the uncovered soil. Tiny particles

One of the "Big Tops" at the scout jamboree.

SCS technician explains conservation measures on Stone Valley Watershed to Boy Scouts.

blew from the stubble-mulched land. Yet the land lay serene where a windbreak and shrub buffers took the force of the blast.

Then, they witnessed hillside farms of a small watershed, all falling to rack and ruin because of uncontrolled erosion and runoff. An SCS technician pulled a string and the picture changed completely as conservation practices shot into view.

Nearby, the boys viewed a mammoth 3-D model of Stone Valley Watershed, exactly like the real one in Northumberland County, Pa. To look at the model was like being in an airplane, looking down on 11 beautiful conservation farms. Clear streams of water flowed down outlets from tiny farm ponds, diversion terraces, and ditches, to form a river. At the foot of Stone Valley, a floodwater retarding dam pooled the water a moment, then let it go gently toward the ocean.

A graceful design of contoured stripcrops tied together the farm buildings, roads, bridges, woods, pastures, and the tiny community, into a pattern of watershed conservation.

Leaving the soil and water exhibit each Scout filled a plastic souvenir bag with 8 ounces of hallowed Valley Forge soil. Emblazoned on the bags were a drawing of George Washington kneeling in prayer during the dark days of 1777–78 and the insignia of the National Association of Soil Conservation Districts.

A running stream, 50 yards long, dropping into an 8-foot pool, introduced boys to the fish and wildlife exhibit. Deflectors, barriers, streambank plantings, and log dams showed Scouts how science makes better fish and fishing. Two fawns and a wild tom turkey, that were nestled in the neighboring woods, helped to demonstrate the techniques of making game feel at home in the American landscape. Scouts made note of exemplary models of nesting boxes, shelters, feed bins, and a living nursery of wildlife feed and cover plants.

Scouts at the soil and water conservation exhibit.

Up in Smokey Bear's area, still more of conservation's magic was displayed. Here were the trappings of the forest fire lookout, with model observation tower, spotting maps, windgauge, radio-telephone, and the vital dangermeter.

Farther on, was still more of the romance of forestry and the gadgets that Scouts love to handle—woodmen's axes, chains, cruising sticks, and fire pumps. Then, there were displays of how trees grow—big and profitable with conservation—poorly without it. The boys gazed in wonder at sections of massive tree trunks brought in from primeval forests that would tower above some of the tall buildings in modern cities.

The conservation carnival went on, all day, for 7 days, at three widely separated areas in the 2,000 acre Jamboree encampment. Success at maintaining a carnival in triplicate had conservation magic too. The achievement was a result of the working-together spirit of three Federal resource agencies—the Soil Conservation, Forest, and Fish and Wildlife Services; and the State agencies working in similar fields in New York, New Jersey, and Pennsylvania.

A number of private conservation organizations, commercial nurseries, and landscape services helped generously. Free copies of a fascinating and instructive booklet, "Conservation Magic for Boy Scouts," prepared by cooperating Federal agencies and printed by the National Wildlife Federation and the Outboard Boating Club of America, will serve Scouts as a valuable aid in conservation information.

As the multicolored tents disappeared, one by one, from Valley Forge, in much the same manner as they did 179 years ago, someone asked the conservation technicians did the Scouts "get much" out of the show. "I doubt if I'd be hoarse and plumb talked-out from answering questions, if these kids didn't get *something* out of it," replied one exhausted booth-tender.

And that was the consensus of those who took part. Scouts at this Jamboree went after details of conservation information like wolves after a lamb. Maybe it was the Great Conservo's potent magic—maybe it was the carnival atmosphere—maybe young America was truly awakening to conservation of the natural riches their forefathers were careless with.

Only the minds and hearts of an army of Boy Scouts now scattered to the far corners of the United States and other countries hold the answer.

They Didn't Wait

Six Farmers Wanted Flood Protection Now, So They Built Their Own Floodwater Detention Dam.

By WILLIAM L. SHEPPARD

SIX farmers, south of Sylvan Grove, Kans., with Federal and county help, built their own floodwater detention dam on the east branch of West Twin Creek Watershed. The structure is designed to retard the flow of floodwater from a 2,650 acre drainage area above the dam. It will protect 310 acres of bottom land and several farm buildings below the dam from the flood damages that had occurred almost every year.

Note:—The author is work unit conservationist, Soil Conservation Service, Lincoln, Kans.

It was quite an undertaking for 6 farmers, since more than 40,000 cubic yards of dirt had to be moved. The permanent pool above the dam contains 24 surface acres. The floodwater storage is about 350 acre feet. But under a pooling agreement, the Agricultural Conservation Program put up about 75 percent of the cost of construction, while the county furnished some heavy equipment and actually moved about 5,000 yards of the dirt used in the fill. Thus, the out-of-pocket cost to the farmers was only about $1,700. In addition, they contributed much time and labor to the project.

The farmers involved include: Joe Kulich, a supervisor of the Lincoln County Soil Conservation District; Henry Mueller, who gave the land for the reservoir; Adolph Kulich, who donated the land for the dam site; and Ernest Kulich, Albert Holle, and John Hynes, all of whom owned land in the small watershed. With a minimum of entanglements, each of these neighbors contributed what he thought was his fair share—considering the benefits to be expected.

Several years ago one farmer had given some thought to building a dam near this site, but nothing ever came of the project. In August of 1956, Joe Kulich suggested the plan for the project to a group of his neighbors at a regular monthly supervisors meeting. Local Soil Conservation Service technicians were called upon to make a topographic survey of the area. A survey of the 2,650 acre (70 percent in grass) drainage area was made from September through November. The project seemed feasible.

SCS designed the structure and prepared the specifications, with the farmers' needs and wants in mind. The floodwater storage will provide for 1¾ inches of runoff from the entire drainage area above the structure. A 240 foot wide emergency spillway was designed. A 24-inch reinforced concrete culvert runoff pipe serves as the primary spillway. In addition, an 8-inch drawdown pipe, with gate valve, feeds horizontally into a 36-inch riser, 12 feet below the normal water level. This way the flow of water can be regulated—stock water and even some irrigation water may be released from the permanent pool during droughts. Furthermore, the lake makes a wonderful wildlife and recreational area for the farmers and their neighbors.

"Regardless of the flood control, the dam in itself is a good thing. It should keep that water up there where it belongs," Holle commented.

Before the dam was built, a road ran down into the creek and farmers could not get

Highland Dam.

through after a heavy rain. Now a road, which is officially closed but maintained by the county for the farmers, runs over the dam. The county receives its greatest benefit in the protection of the gravel road immediately below the dam. Running south out of Sylvan Grove, the road is a connecting link to U. S. Highway No. 40.

As the Soil Conservation Service technicians did the necessary survey work and staked out the structure, the farmers started getting estimates from contractors and on materials. Also, they worked out arrangements with the county commissioners.

The heavy equipment was moved on the site December 3. Farmers showed up and began to install the 90 feet of 24-inch runoff pipe. Coming in 6-foot sections, the concrete pipe was made watertight with rubber gaskets and rubber cement at the joints. A concrete cradle was poured to serve as a base and keep the 24-inch runoff pipe in alignment. Twenty-two feet of corrugated metal pipe extends the outlet at the lower end.

Soil Conservation Service Engineer, Denneler, worked side by side with the farmers installing the pipe and riser. The group made themselves useful in many other ways to keep down the cost. Because of the good cooperation of all, the project was completed December 28, in less than 1 month's time.

This group of farmers had observed the benefits of floodwater-retarding structures, especially on the Lost Creek pilot watershed in the northern part of Lincoln County. They decided they needed such a dam. They didn't want to wait for it. So they pooled their resources and set out to see what aid they could get. Thanks to ACP, SCS, the county government, and others they got their dam less than 5 months after the time they first agreed to build it. They have named it "Highland Dam."

Farmers and SCS technicians laying 24-inch concrete pipe for principal spillway of Highland Dam.

DISTRICT PROFILE

L. L. MALES of OKLAHOMA

FEW groups in Oklahoma, Kansas, or Texas think these days of starting a watershed project without asking L. L. (Red) Males to have a hand.

Males is the Cheyenne, Okla. bank president and farmer whose story of the Sandstone Creek Watershed in the Washita River flood-prevention project has claimed the fascinated attention of audiences the Nation over.

Obviously, no one in Oklahoma is better qualified to talk on the subject. Males has lived all his life in the district in which he has been a soil conservation district supervisor for the past 18 years.

As a citizen he has watched the effect of soil and water conservation on the life of his community. As a banker he has noted its effect on business. As the operator of a 3,000-acre farm and ranch he has practiced conservation in all of its ramifications.

As a neighbor he has seen the benefits conservation has given to men he has known since boyhood. He has seen the changes the watershed program has made in once powder-dry Sandstone Creek, and he reports the contrast between this sparkling, flowing stream with that of the still-parched beds of nearby untreated creeks.

For a glimpse of Males in true proportion you should go back to the boyhood he spent on a sandhill farm in Reydon community in what is now a part of the Upper Washita Soil Conservation District. This area has been one of the most hazardous in Oklahoma's agriculture.

Wind and water erosion both are a constant threat to the land. Rainfall is erratic. The inherent fertility of the soil is low.

Males got into banking by the side door, you might say. He got a job as janitor of the Strong City Bank to help pay his way in high school. Now, he is president of this same bank —the Security State Bank of Cheyenne.

Before the soil- and water-conservation movement came into being, and the Upper Washita Soil Conservation District was formed, Males was fostering the conservation idea by furnishing farm levels and terracing equipment to farmers who wished to do their own conservation work.

He already had been a force in getting citizens interested in the big Washita Valley move toward flood prevention. And when the Soil Conservation Service was established and the Upper Washita District was organized, Red Males was ready to give both a push.

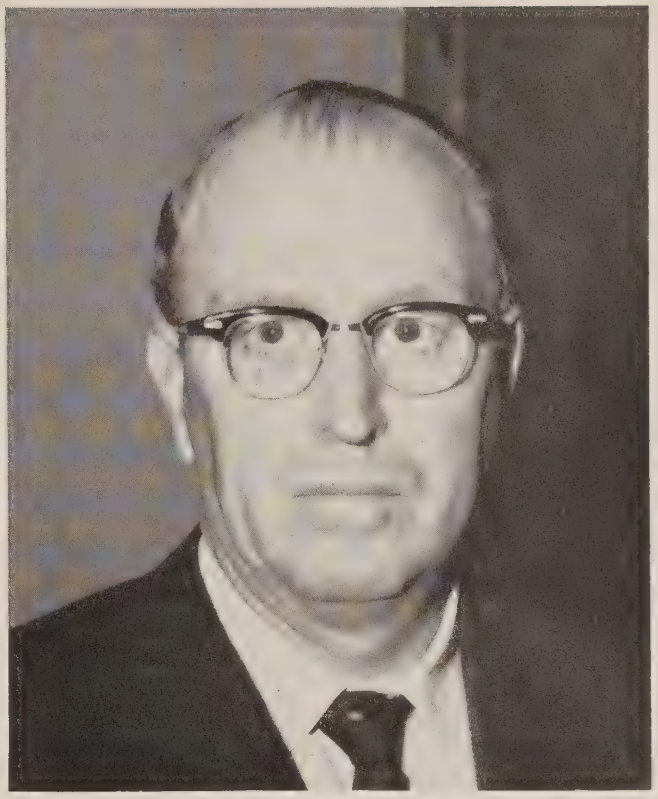
He is secretary of the Washita Valley Flood Control Council after having served repeated terms as the council's chairman. He has served several times as chairman of his soil conservation district and now is vice chairman.

Secretary of Agriculture Benson recognized his ability by naming him, in 1954, a member of the 18-man Advisory Committee on Soil and Water Conservation. More recently Governor Gary appointed Males to a 6-year term on Oklahoma's new Water Resources Board.

Males has given his color-slide lecture on upstream flood prevention and Sandstone Creek nearly 100 times. He has driven many thousands of miles on such assignments, usually paying his own expenses and nearly always, if the meeting is in Oklahoma, driving back to Cheyenne during wee hours of the night.

He has given his lecture before cabinet members and congressional committees, before national meetings of the Farm Bureau Federation, Friends of the Land, National Association of Soil Conservation Districts, and countless other groups.

Frequently Mrs. Males, whom he calls "a soil conservation widow", or their older son, Jim, is called upon to operate Males' slide projector. Sometimes it is a volunteer from the audience. Recently it was a visiting missionary from India, Forest Conser, of Bombay State, who had called on Males to learn of upstream flood prevention techniques.



L. L. (Red) Males

Males starts his lectures by explaining: "I am just a country banker. I'm not an expert in any way in soil and water conservation. . . ." And after that simple introduction his audience becomes transfixed as the tale of achievement in one small watershed unfolds.

Males' voice is soft and seldom raised. His manner is one of patience, and he shows a willingness to hear the other side of an argument. Only when someone questions the value of watershed conservation and development, or expresses doubt that a community has the resources to do the work, is his voice apt to assume a dominant pitch and the hand close, to drive home a point in support of his favorite argument.

Red Males keeps saying he must turn some of the "missionary" work in upstream flood prevention over to other folks. It is taking too much of his time. Yet, you know as he says it, this will be a tough thing for him to do. Watersheds and soil conservation have become too much a part of his life.

—Tarleton A. Jenkins

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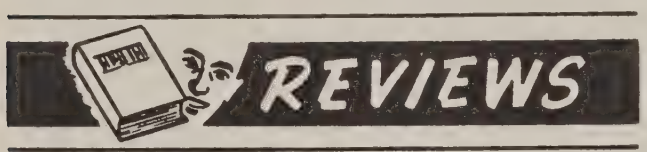


GRASSLAND SEEDS. By W. A. Wheeler and D. D. Hill. 734 pp. Illustrated. 1957. New York: Van Norstrand Co., Inc. $12.50

THERE has been a growing demand for this book as grassland seeds play an ever-increasing and important role in agriculture. Until the latter part of the 19th century, grassland seeds were the product of the hay mow. Today, they are a specialty crop, produced and marketed by a well-organized seed industry. The authors relate how an awareness of the need for grass seed grew in this country after the ravages of soil erosion were noted. The many techniques, skills, and facilities in this field of endeavor are presented in a well-organized and an interesting manner.

Several chapters contain helpful information on how to select a potentially profitable crop, what fertilizers to use, when to harvest, and how to choose and operate the equipment best suited for the particular crop. The delicate business of seed drying, processing, and storing the seed without impairing its quality is discussed in considerable detail. Marketing of seed is also given considerable space.

A large part of the book is devoted to a discussion of the principle legumes and grasses as specific grassland crops. Each one is treated as to its importance as a crop, seed traits and characteristics, management for seed production, seed harvesting and cleaning, and statistics on yield and production.

An appendix, of 100 pages, contains such useful items as a glossary of technical terms, tables and plates of nearly 400 species and varieties that give the number of seeds per pound, purity, viable seed, longevity, and sowing-rate per acre. "Field seed statistics" give the acres harvested, yield, and supply of the principle grassland seeds. "Screens and screening suggestions for cleaning commercial grassland seeds" provide useful information to one interested in furnishing high-quality seed for the market. "Seed Certification Standards" aid the grower in meeting the requirements set for producing quality seed.

In a final chapter, the authors call attention to "Seed Improvement" in which the breeder, grower, producer, processor, and distributor represent the facets of the seed industry referred to as the "Seed Trade."

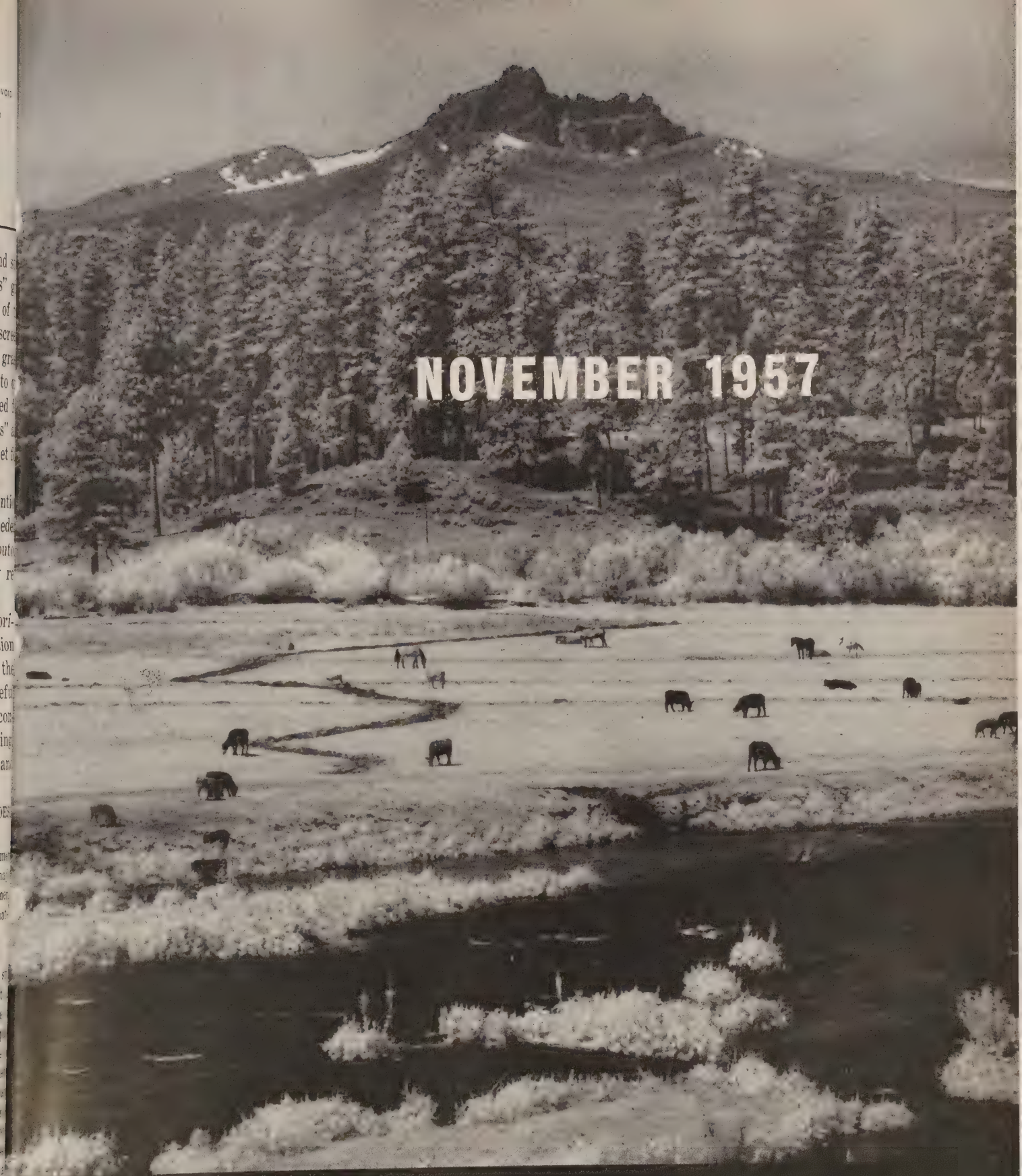
This book, written by two eminent authorities on the subject, is a worthwhile contribution to American agriculture. The seed grower, the technician, the seed vendor, will all find useful and up-to-date information that should contribute to well-planned production, stocking, distribution, and improved use of grassland seeds.

—A. D. STOESZ

INVEST AND IMPROVE.—From 1946 to 1956, farmers in the United States spent about $45 billion on major improvements and additions to plant and equipment. This was about $14 billion more than the estimated $31 billion required to cover depreciation.

OUR COMMON GOAL remains that of getting still needed conservation practices on the land as fast as possible, consistent with obtaining a full measure of sound and lasting conservation for each dollar of public or private money spent. In doing so, we have to stick to the basic principles that have proved themselves over the years. The expanding watershed and other approaches to our resource conservation problems, in fact, intensify the importance of soil surveys to determine land capabilities, of acre-by-acre conservation farm planning, and of treatment and use of all our lands within their needs and capabilities.

—D. A. WILLIAMS, *Administrator*
Soil Conservation Service



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OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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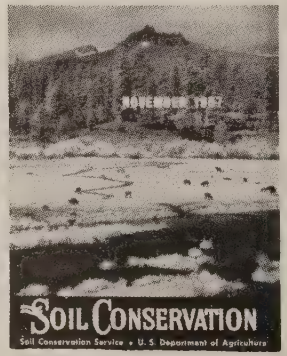
CONSERVATION NEEDS INVENTORY. — The policy and procedure for making a national inventory of soil- and water-conservation needs has been agreed to by an interagency committee of the Department of Agriculture, and field work on the inventory is expected to start soon. The goal for completion of the inventory is set as 1960 by the committee.

The inventory will encompass two main phases: (1) an inventory of land use, conservation problems, and acreage needing treatment, and (2) an inventory of watershed project needs as authorized by P.L. 566.

SCS will assume leadership in making the inventory but will be assisted by seven other Departmental agencies and expects to receive cooperation of State and local agencies as well as some Federal agencies in other Departments.

This inventory will be broader in scope and more specific in detail than any other ever attempted before. The primary purpose is to provide accurate information to all Departmental agencies engaged in soil- and water-conservation work. The inventory should also provide valuable information to soil conservation districts, State conservation agencies, watershed associations, and others concerned with conservation work.

Basic facts about land use and soils will come from soil surveys on sample areas to supplement data from the more than 500 million acres of surveys already made. Experiences from small watershed projects underway will serve as a guide in making the watershed conservation needs inventory.



FRONT COVER. — Feeder cattle and horses on a mountain meadow in Oregon.

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A Bright Outlook For Wildlife

By A. E. BORELL

WE have more kinds and greater numbers of game birds, game mammals, furbearers, and game fish in the United States today than were present when white men first set foot on American soil. And our soil- and water-conservation programs should continue to maintain, and even to expand, our fish and wildlife populations and the hunting, fishing, and other recreation that goes with them.

Some people question such optimism. We frequently hear that Man and his activities have seriously depleted our game and fish. We also hear that "Hunting and fishing ain't what they used to be; I have hung up my rod and gun." Even some wildlife administrators tell us that drainage, cultivation, livestock grazing, water control, weed sprays, timber cutting, and modern farming methods are wiping out our game and fish. They would lead us to believe that wildlife is going downhill rapidly and soon will be a thing of the past.

This picture of gloom is not new. Back in 1883, Frances Francis, an English writer, said, "They always tell you things used to be better than they are now, and that something or other is ruining them." Francis was speaking about fishermen. How much basis is there for this kind of anguish and propaganda?

Certainly there have been changes in species and shifts in populations. The passenger pigeon, heath hen, and bison are gone—in their stead we have pheasants, chuckars, Hungarian partridge, and a tremendous population of deer. While many streams and natural lakes have deteriorated and some species of fish have declined, let us not forget that we now have thousands of acres of manmade ponds, lakes, and reservoirs that provide fishing. Many of these are in areas where little or no fishing existed 100, 50, or even 10 years ago.

Recently, I attended a meeting presided over by one of our top game administrators. At that meeting there were indications that Utah, Colorado, Montana, and Wyoming are competing in their efforts to attract out-of-state hunters to help harvest their overpopulations of deer, and in some cases, elk and antelope. We hear reports of overpopulations of deer in Pennsylvania, Wisconsin, Michigan, Texas, West Virginia, California, Arizona, and a few other States. By overpopulation, I mean not merely more deer than the range will carry, but actually more deer than the hunters want to harvest.

Last year, Colorado had the most liberal deer hunting season in the history of the State. This year the license fee will be lower and the bag limit will be even larger. For $12.50, the Colorado resident this year will be able to take 4 deer in large sections of the State. Few hunters or families want more than 1 or 2 deer, but they can have 4 if they want them.

In 1955, I attended a technical session of the Western Association of Game and Fish com-

Pintail ducks at Roach's Run, Va.

Note:—The author is biologist, Soil Conservation Service, Denver, Colo. This article is based on a talk given at the annual convention of the Izaak Walton League, Golden, Colo., June 1957.

All photographs used with this article were furnished by the Fish and Wildlife Service.

missioners dealing with upland game birds. In that session, several game technicians discussed the subject of "How to Get Adequate Harvest of Pheasants, Sharptail, and Blue Grouse"—in other words, "how can we get the hunters to check overpopulation?"

Last year (1956), the legal hunting season on sharptail grouse in North Dakota was more liberal than in many years. Colorado and New Mexico had larger quail populations and longer hunting seasons than for many years.

In the publication, *New Mexico Wildlife* for June 1957, Levon Lee, chief of game management for the New Mexico department wrote, "New Mexico's . . . antelope, elk, mountain sheep, javelina, turkey, and . . . deer continue to increase."

In the June 1957, issue of *Field and Stream,* Conservation Editor, Harold Titus reported that "West Virginia game officials are complaining that their Sleepy Creek State Forest, although it is only 80 miles from Washington, D. C., doesn't attract enough hunters to keep the deerherd within bounds or to make a dent in the population of turkey, grouse, and squirrels. The State is even offering to show hunters the way around the area. . ."

In the June 8, 1957, *Newsletter* of the Colorado Game and Fish Dept., Dean Coleman, fur manager, is quoted as saying, "Colorado's population of furbearing animals is holding up well with some species, such as raccoons and foxes, increasing a bit too rapidly."

Note that these statement report conditions in 1957, not 1857.

Another indication of the abundance of hunting is the fact that in many States we pay bounties or hire hunters to kill pumas, wolves, coyotes, foxes, and badgers. If we were really short of hunting, we would have these animals on our game list instead of on the vermin list. All of them offer excellent sport for the hunter and his dogs.

The spread of native game species to new ranges, especially raccoon, foxes, tree squirrels, and deer on the Plains is notable. Today there are sizable populations of these animals on the Plains in areas where 50 years ago there were few or none. In many cases, this spread is due almost solely to the planting of windbreaks and shelterbelts in areas where no trees previously existed.

Even waterfowl—that wildlife resource which, according to some "prophets of doom," is being destroyed by drainage—has been on the upgrade for several years.

These conditions don't indicate that lumbering, farming, and grazing are wiping out our big game, upland game birds, furbearers, or waterfowl.

In regard to warm-water fish, almost every publication we pick up tells us that our warm-

Wild tom turkeys strutting on a wildlife refuge in Oklahoma.

Deer in the Black Hills region of South Dakota.

water fish populations are being underharvested. This is often true even of trout in water more than a mile from a road. Nevertheless, new reservoir construction, as well as developments in the control of rough fishes and the rehabilitation of lakes and reservoirs, will further increase our warm-water fish and trout producing opportunities.

Furthermore, largely through assistance from the Department of Agriculture, hundreds of thousands of farm and ranch ponds have been constructed during the past 20 years. Many of these ponds are now providing fish for warm-water species and for trout. These small ponds can be fertilized and managed for high production. More research on stocking and managing of farm fishponds, and more technical assistance to farmers on fishpond construction and management problems can increase this fishing resource by perhaps tenfold—maybe more.

Why are most species of fish and wildlife holding their own or increasing in the face of drainage, grazing, lumbering, water control, and intensive farming activities? Among the many reasons are:

1. The cutting of dense stands of timber permitted the growth of grasses, forbs, and shrubs. This increased the carrying capacity for deer, elk, grouse, furbearers, and many others.
2. Heavy grazing of some rangelands by domestic stock favored forbs and shrubs over the grasses. As a result, the carrying capacity for deer, elk, antelope, quail, and rabbits, has gone up.
3. The construction by farmers and ranchers of thousands of reservoirs, lakes, ponds, ditches, and windmills has put water on millions of acres where previously water was the limiting factor for wildlife. Bureau of Sport Fisheries and Wildlife surveys show that in Montana there are about 111,000 ponds, and in South Dakota, roughly 107,000 manmade ponds. In Colorado, over 14,000 ponds have been constructed in the past 20 years. In the United States, over 800,000 ponds have been constructed in soil conservation districts since 1937. These manmade ponds provide water for big game, furbearers, upland game birds, and, in addition to providing drinking water and resting places for migrating waterfowl, many of them produce one or more broods of ducks each year.
4. Soil conservation districts and the Department of Agriculture have sponsored conservation practices such as stripcropping, contour cultivation, proper irrigation, crop rotations, stubble mulching, grassed waterways, improved pastures, range management, farm and ranch ponds, windbreaks, and other erosion-control measures. These practices have slowed erosion, increased

Canada geese on a pond near Horicon, Wis.

Lesser snow geese and Canada geese on Bear River Migratory Bird Refuge, Utah.

the quality and quantity of plant growth, and thus the ability of millions of acres to support more people and more wildlife.

5. Wheat, corn, milo, rice, pasture grasses and legumes, and other farm crops produce high quality wildlife foods in quantities far beyond that produced by the original grasslands, forests, and deserts. Thousands of mallards now winter in Colorado. I am certain that few ducks wintered there before farmers planted winter food in the form of grain crops. It is obvious that pheasants could not have lived in most of the United States prior to the planting of agricultural crops.
6. It is true that large areas of land were cleared and thus many acres of wildlife cover were destroyed. In their place, though, we have thousands of miles of fence rows, windbreaks, shelterbelts, ditchbanks, drainage canal banks, roadsides, grassed waterways, and terraces that provide cover and travel lanes for upland game. Although in many areas there is a smaller total acreage of cover today than 50 years ago, there is more food for many species and far better distribution of cover, in relation to food and water, and, thus a higher carrying capacity for most kinds of wildlife.

There are now over 2,750 soil conservation districts in the United States. In these districts more than 3,000,000 acres of trees have been planted; more than 26,000,000 acres of pasture and range have been seeded; more than 3,000,000 acres have had wildlife practices applied and more than 800,000 ponds have been built. In addition to these conservation practices that have secondary wildlife values, during the past year the Department of Agriculture designated three specific wildlife practices as eligible for cost sharing when applied on Conservation Reserve lands.

The people of the United States and of the world are learning more about the wise use of land and water. I am confident that 10, 50, and 100 years from now, the ability of the land and water, of the United States and of the world, to support people and wildlife will be greater than it is today, and that our populations of fish and wildlife also will be greater.

MORE TIMBER IN NORTH CAROLINA.—The sawtimber supply in North Carolina is better now than it was 17 years ago, and current growth—even in large pine sawtimber—is more than sufficient to replace timber cut, according to a recent survey of the Forest Service. The State had 17 percent more timber volume in 1955 than in 1938, though the average size of trees was smaller and there was a larger percentage of hardwoods.

North Carolina now has 1,200,000 acres more forest land than it had 17 years ago.

Better Nursery Stock

A Minnesota Nursery Improves the Quality of Its Plants While Checking Erosion and Building Up Soil Fertility.

By LEONARD E. BULLARD and FRANCIS L. PAULSON

THE Bailey brothers, nurserymen, near St. Paul, Minn., have found that they can produce higher grade nursery stock by using the best soil- and water-conservation methods. Terraces, waterways, contour rows, crop rotations, fertilizing, cover crops, and green manure crops are among the soil conservation measures used.

"Since we established the soil- and water-conservation practices, we find that our nursery stock averages one grade better than before," Vincent Bailey stated. "More than a third of the stock is growing to the larger sizes. In 3 years we get growth that formerly took 4 years, and our tree survival has been better."

Vincent and his brother, Gordon, have operated the J. V. Bailey Nurseries in Washington County since taking over from their father in 1943. They have more than 400 acres in nursery stock all the time, much of it with rolling, silt loam soils.

As every nurseryman knows, nursery production is rough on land; it means intensive land use. Most farmers think of corn or soybeans as soil depleting. From a soil-depleting standpoint, nursery planting is just as depleting as corn—only more so. The land is in cultivation almost continuously. There isn't much opportunity to put back fertility in the form of grasses and legumes. Constant cultivation lowers the land's resistance to the pounding of raindrops, and soil erosion naturally follows, particularly if the land has any slope at all. In addition, every time an evergreen is sold, a ball of soil goes with it, so that even without erosion, the topsoil is gradually depleted.

Note:—The authors are, respectively, area conservationist, St. Cloud, Minn., and work unit conservationist, Stillwater, Minn., Soil Conservation Service.

Nursery stock growing on terraced field of Bailey Nursery.

Soil erosion and declining fertility were becoming serious problems. The Baileys had been forced to abandon one 20-acre field because of severe sheet and gully erosion. This field had produced good stock for more than 15 years.

In 1945, they decided to do something about this problem and called on the supervisors of the Washington County Soil Conservation District. Soil Conservation Service technicians went over the farm with the Baileys. A soil survey was made that showed specifically what the soils were like and what they were best able to do.

The technicians and the Bailey brothers then worked up a conservation plan for the nursery land. They planned for terraces on the sloping land with grassed waterways for terrace outlets. New plantings were laid out on the contour. And crop rotations that included grass and legumes were worked out.

The contouring and terracing was a drastic change in the nursery operation. Before putting this part of the plan into operation, Vincent Bailey, who handles the field operations, and his field foreman, Carl Johnson, made a trip to Shenandoah, Iowa, to see how nursery operations with terraces and contouring, would work out. What they saw convinced Vincent the system was practical and that they could use it nicely on the Bailey Nurseries.

They built their first terraces, in 1946, doing the entire job with a breaking plow. A heavy rain gave them a good chance to see what they had accomplished just after these first terraces were finished. There was very little erosion on the terraced field. On a field right next to it gullies from 6- to 8-inches deep were gouged out by the heavy runoff.

Vincent Bailey (left) and Gordon Bailey display a well-rooted specimen grown at their nursery.

The Baileys have built 20 miles of terraces since that first terracing job was completed in 1946. They have established and seeded about 1.5 miles of terrace-outlet waterways and an additional 1.6 miles of grass waterways in unterraced fields.

On one field that had a large raw gully they put in a concrete drop outlet. This structure drops the water 20 feet and protects the head of the gully from further cutting. Other drop structures are planned on two additional sites where gullies are threatening to damage a field road. At one of the structures a diversion dike was built wide enough to serve as a field road.

One of the most interesting features of the nursery-conservation plan is the crop rotation. The Bailey's decided on a 9-year rotation plan. For 6 years the land would be in nursery stock, followed by a crop of oats seeded to alfalfa and brome, that would be left in hay for 2 years. The oats and hay are harvested, except for a last cutting of alfalfa the second year. This growth is plowed under for green manure.

The 6 years of nursery crops consist of stock that is on the land for periods of 2 to 6 years. Very few 1-year crops are grown. The 5- and 6-year crops are mainly spruce and pine. The 2-, 3-, and 4-year crops are mostly ornamental shrubs, hardwoods, and fruit trees.

Commercial fertilizers are used if the plants show a need for it. Barnyard manure, at the rate of 40 tons per acre, is applied ahead of each nursery crop unless the crop is preceded by sod. Each year 25 acres of green manure crops, mostly sudangrass, are plowed under, and 40 acres of cover crops (mostly rye) are used. The Baileys are fortunate in being close to the south St. Paul stockyards, where they get their manure.

Vincent Bailey says that he is planning on trying an 8-year rotation of 1-year grain seeded to alfalfa brome, one year of hay, with all material to be chopped and left on the field, and then 6 years of nursery stock with heavy applications of manure.

Pipeline In The Sky

A New Mexico Rancher Solves a Water Problem by Suspending an 1,800-foot Pipeline High Over the Bed of a Deep Gorge.

By JAMES E. REEVES

JOHN S. EAVES, a rancher near Tularosa, N. Mex., had more than 5,000 acres in one of his pastures from which he could get little use because there was no water for the livestock. The only water in the entire pasture was a small seep spring in the face of a cliff high above the head of a deep, rocky gorge.

Previous owners had tried numerous devices to bring the water down from the cliff so it could be used by livestock. Each attempt proved futile, because flash floods soon undid their work.

Eaves figured that if he could get the water down to his pasture, he would have more than 5,000 additional acres that could be grazed by his cattle. He pondered the problem as he studied the washed-out efforts of previous owners. He considered the possibility of laying a pipeline along the hillsides, out of reach of damaging floods. However, the rocky cliffs and the necessity of crossing several side canyons convinced him that this would be impractical.

Then he hit upon another idea. If he could string a cable down the canyon from the spring, and fasten a pipeline to it, he could put the water where his cattle could use it.

After studying this plan carefully, Eaves sought advice from Soil Conservation Service technicians assisting the Otero Soil Conservation District, with which he is cooperating. The technicians studied his plan and agreed that it was practical and feasible. Following suggestions for a few minor changes in his original plan, Eaves and his two sons, John and James, went to work.

Using only hand tools, they dug holes on the points of four ridges that jutted out into the canyon. Heavy cedar posts 8 feet long were set in concrete in the holes to support the pipe and cable.

The seep spring was cleaned out, and a shelf dug out of the rock at the base of the spring on which was laid a 4-foot piece of perforated 4-inch pipe to serve as a collection gallery for the water. A 1-inch pipe reducer was put on the perforated pipe and nipple added for attaching plastic pipe.

U bolts and chains were concreted into holes drilled in the rock to serve as anchors for the cable. Flash floods, carrying huge boulders down the canyon, necessitated building a strong sloping roof of rock and concrete over the perforated pipe and the anchors for protection. An old slotted grader blade embedded in the roof let the water into the collection gallery.

A concrete dead-man anchor, with a heavy cable attached, was poured at the lower end of the canyon. Obtaining 1,800 feet of used $\frac{5}{8}$-inch drilling cable, Mr. Eaves, with his farm tractor, pulled the cable up the canyon bottom to the spring. Using a block and tackle, the cable end was hoisted up to the U bolts near the spring,

John S. Eaves and son John look at their pipeline in the sky.

Note:—The author is work unit conservationist, Soil Conservation Service, Cloudcroft, N. Mex.

where it was attached with cable clamps. With the help of block and tackle, the cable was hoisted up to each of the cedar-post supports on the ridges and threaded through cable blocks chained to the top of each post.

A heavy block and tackle was attached to the lower anchor cable and clamped to the suspension cable. Using a farm tractor and a pickup truck for power the cable was pulled up taut and clamped securely to the anchor. At each of the post supports, the blocks were taken off and the cable lashed tightly with chain.

The next problem was to string the 1-inch plastic pipe and fasten it to the cable. After stringing the pipe to the spring and clamping it to the outlet pipe, it was ready to be fastened to the cable with wire. Pieces of hose were used as shims to keep the wire and cable from wearing into the pipe.

A trolley, made from an old jeep seat, suspended on two sheave wheels was rigged up and Jim Eaves volunteered to ride the trolley and wire the pipe to the cable. "After the first span, if I didn't look down, it wasn't so bad," Jim commented. "Dad pulled me along and I tied the pipe on."

The pipe was strung in 4 spans — one span being over 600 feet long and some 60 feet above the canyon floor.

A storage trough for the water was moved in, and it soon supplied water for the 50 head of cattle.

Jim Eaves on trolley, lashing plastic pipe to cable.

Stock water trough filled with water from completed pipeline on the Eaves ranch.

Mr. Eaves commented, "Even though this job took over 2 months to complete, it is well worth it. But my work isn't done yet, for this place needs a lot more work and careful management to bring back its grass and stop all these washes."

CONSERVATION AT TRAINING SCHOOL.—The State training school for the mentally handicapped at Parsons, Kans., teaches up-to-date farming methods, including soil and water conservation, to its students. The advanced training methods are showing results, not only in the wards and classrooms but also on the 500-acre farm of the school.

W. C. Baumgardner, farm supervisor, has been with the school since 1920. Last year he supervised the construction and seeding of a grass waterway and the construction of more than 10,000 feet of terraces. All construction was done with equipment owned by the school.

Soil Conservation Service technicians have helped develop a conservation plan for the farm and have furnished technical assistance in the layout of conservation practices.

Alfalfa and bromegrass are the principal forage crops used in the conservation rotation. Around 200 acres are kept in alfalfa or alfalfa and brome. The forage is consumed by the 50 dairy cows of the school.

Large quantities of barnyard manure are applied to the land regularly. Commercial fertilizers and lime are also used, as soil tests indicate they are needed. The fertility level of the soil is well above the average for the community.

A modern milking barn with up-to-date equipment is used as one of the training laboratories for the school. All milk is used at the institution.

According to Dr. H. V. Blair, superintendent of the school, the training is designed to prepare students to return home with knowledge that will allow them to become self-supporting citizens.

—Melvin M. Thompson

GRASS & CATTLE IN BALANCE

Two Brothers in South Dakota Found That Most of Their Ranching Problems Disappeared When the Forage Crops and Cattle Were Kept in Balance.

By LESLIE R. ALBEE

"BALANCING livestock numbers with year around range forage and feed supplies has solved our major range problem. We have increasd our calf weights 68 pounds in the past 6 years," declares Leo DeJong.

Leo and his brother, Bud, operate their 6,000-acre ranch on White River, 16 miles south of Kennebec, S. Dak.

Bud is the livestock man, while Leo is the grass man. They always consult one another before making important decisions on livestock and grazing management and feed production operations.

They favor Aberdeen-Angus cattle, although they acquired about 100 Hereford cows with the ranch in 1947. They also have some purebred Scottish Highlanders to compare their wintering characteristics with Angus and Herefords. Their long-time plan has been to sell the Herefords and cross Angus with Highlanders.

"I believe Angus cows with one-fourth Highland blood will winter better, and one-eighth Highlander calves will outproduce our straight Angus calves," Leo commented.

The topography of their ranch varies from flat river bottoms to abrupt, steep slopes and rolling uplands.

The DeJongs' ranges are well grassed with short, medium height, and tall grasses. Western wheatgrass and green needlegrass are their dominant cool season grasses. Their principal warm season grasses are big and little bluestem, blue and sideoats grama, prairie sandreed, sand dropseed, and buffalograss. This excellent combination of native grasses affords a long, green-grass period from early spring to early fall.

Note:—The author is range conservationist, Soil Conservation Service, Rapid City, S. Dak.

The DeJongs were running about 400 cattle in 1951. Their pastures were closely grazed, although the condition of their ranges averaged good. That is when they became cooperators with the Hamil Soil Conservation District.

"At that time we were overstocked and short of early spring pasture and hay. We decided to move about half of our cows onto rented range for 4 months, the first 2 years," Leo stated.

Relieving the spring pressure on summer ranges by grazing 150 cows on outside pasture, in 1951 and 1952, was the starting point of the DeJong's range-improvement program. The native grasses responded to the lighter spring grazing. The taller grasses increased at the expense of the shorter, less productive ones. Extra grass mulched the soil so that more moisture soaked in. More grass was produced per acre, as stored soil moisture increased. Less runoff and soil loss resulted. Range condition improved.

The second step was to seed nearly 300 acres of cropland to alfalfa, crested, and intermediate wheatgrasses, and smooth brome for hay. Previously, their only hayland was 80 acres of native grass that was flooded by their water-spreading system.

A good stand of alfalfa and grass was established, followed by an outstanding alfalfa seed crop in 1952. A range field tour was held on the DeJong ranch the following summer. "We made more money on alfalfa seed that year than we've ever made by farming. We had a good hay crop, too," Bud declared.

Bud (left) and Leo DeJong with some of their calves on winter feed.

"Our water-spreading system on 80 acres has more than doubled the production of native western wheatgrass and green needlegrass hay," Leo reported.

"Recently we built a series of earth dams on the draw above our spreader system to reduce the silt flow. Our neighbor up the draw started with several of these dams, so we tied in with his. Last year was the first time we've had clear water spread over our native hayland.

"We pump water from White River, on our alfalfa, to supplement rainfall and runoff water," Leo continued. "Extra water on these haylands provides us with the hay we need to carry us through hard winters.

"One year we shipped 100 tons of alfalfa to Missouri at more than $20 a ton. We shouldn't have sold it. It was the first and last hay we've ever sold. If hay is worth $20 a ton in Kennebec, it's worth that much to us right here on the ranch," Leo added, with emphasis.

Cross-fencing, in their 2,350-acre summer and 1,800-acre winter pastures, has improved grazing management. "It helps both the grass and cattle to have fresh pastures to move onto as the grazing season progresses. We have built needed stock water ponds in each pasture, too," the DeJongs pointed out.

They changed their cow-calf operation to a cow-calf-yearling steer basis. They reduced the breeding herd from 300 to less than 225 cows by selling the Hereford cows and culling their Angus herd. They sell their heavy Angus calves for top prices and buy light, well-bred calves to run until they are long yearlings.

"In 1956, our calves weighed 468 pounds as compared to 400 pounds or less before we improved our ranges. The calves were so uniform and heavy that we sold them all last fall for 24 cents," Bud said.

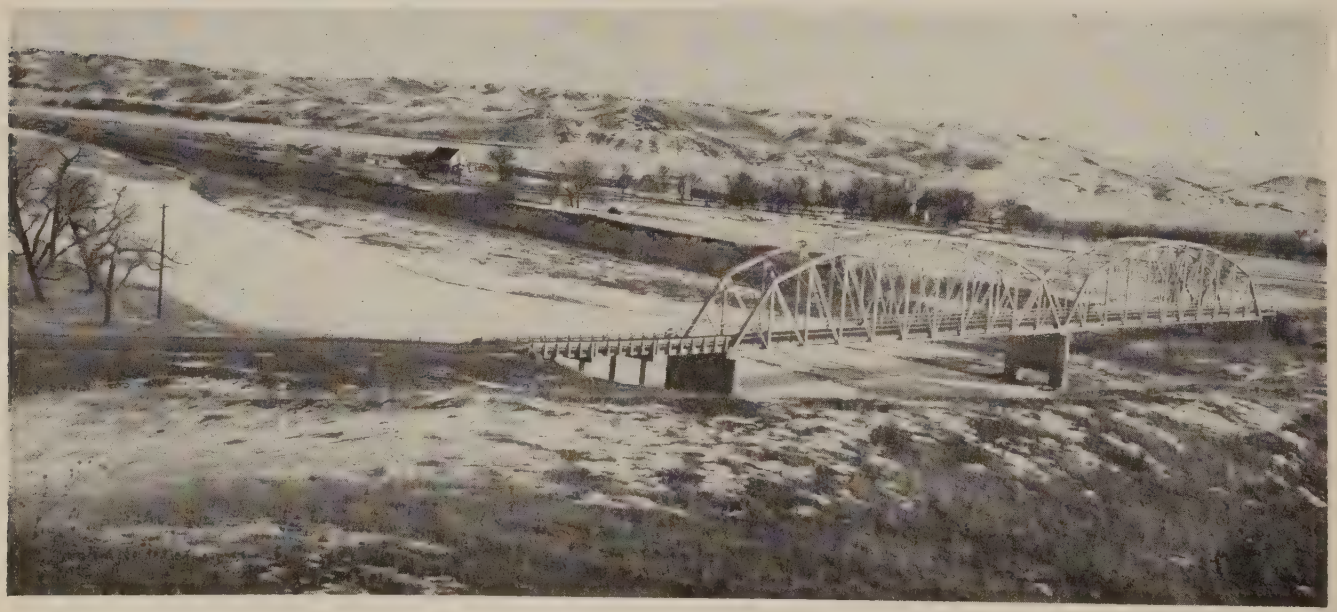
"We buy good weaner calves at about 350 pounds. We usually buy about 150 to 250 calves each fall, depending upon range condition. We prefer Hereford-Angus crossbred calves. We plan to put about 400 pounds of weight on them."

Leo added, "We put winter gain on these light calves by feeding them alfalfa, ground corn, and oats."

"These yearling steers gain quickly in the spring and summer on good grass. They will weigh nearly 750 pounds by fall.

"This winter we have 350 acres of windrowed hay for our cowherd. By mowing, when the protein content is 6 to 9 percent, we can save protein for winter use. At $80 or more a ton for cake, we prefer to grow our own protein in alfalfa and grass hay.

"We have caked heavily in the past, but in the present price-cost squeeze, it is much cheaper to grow our own protein," the DeJongs agreed.



The DeJong ranch on the White River, S. Dak.

"If extended drought hits our ranges, we plan to sell our steers so we can maintain our cowherd intact. We think we can keep our 200 to 225 cows through a severe drought without having to reduce our herd," they observed.

The DeJong ranch is well-balanced between livestock numbers, hay, and other harvested roughages and native grass.

"Now we can surely breathe easier than we could back in 1951. Our range problems have nearly all disappeared. Our calf weights have increased. We have improved our rangelands and balanced our livestock forage and feed supplies. And, we've made money doing it", concluded the DeJong brothers.

The Ladies Take Over

Ladies Auxiliaries of Two Soil Conservation Districts in Oklahoma Assume Responsibility for Educational Activities

By CHARLIE KILPATRICK and
A. P. OTTINGER

THE ladies auxiliaries are taking over more and more of the educational activities of soil conservation districts in Oklahoma. Two of the more active auxiliaries of the State are those of the Upper Washita and Caney Valley Districts.

The Caney Valley Auxiliary only came into existence in February 1956. It has already assumed responsibility for practically all educational work of the district, and has branched out into State and national activities. The group works closely with the county superintendent and teachers organizations to get more and better conservation taught in the schools. They help sponsor speaking, essay, and poster contests for 4-H and FFA members. One of their pet projects is sponsoring Soil Stewardship Week for the district.

One of the first jobs taken on by the auxiliary was acting as hostesses and tour guides during

Note:—The authors are work unit conservationists, Soil Conservation Service, at Bartlesville and Clinton, Okla., respectively.

Charlie Kilpatrick discusses soil profiles with members of the Ladies Auxiliary of the Caney Valley District.

"Open House for Double Creek Pilot Project" where more than 400 farmers and ranchers observed detention dams and land-treatment measures applied for upstream flood prevention. Women were assigned to each of the 11 school busses to hand out brochures and to serve as tour guides for the 20-mile trip through the area.

During the national meeting of the Soil Conservation Society of America at Tulsa, auxiliary members were present at the Caney Valley Soil Conservation District booth to tell the story of the Double Creek upstream flood-prevention project. Similar services are rendered annually during the Washington County Fair.

A program is given each year before the Bartlesville Lions Club. This includes an elimination speaking contest for district cooperators to select members that will represent the district in the area and the statewide contests.

One of the outstanding achievements of this auxiliary was in getting the home demonstration council to ask home demonstration clubs to set aside their April meeting to study conservation, and the July meeting to study farm legislation, especially P. L. 566.

A portion of each monthly meeting of the auxiliary is given over to a study of current problems, which so far has included soils, range sites and conditions, identification and evaluation of range plants, upstream flood prevention, legislation affecting soil and water conservation, goals and objectives, etc. Auxiliary members schedule neighborhood group meetings and arrange for twilight tours followed by a basket

Mrs. Ray Stucker (left) and Mrs. Curtis Murphy, of the Upper Washita District, look at prize winning posters from the contest sponsored by the ladies auxiliary of the district.

supper. Officers of the auxiliary attend the regular monthly board meetings of supervisors, and make reports and offer assistance. Each auxiliary member is able to explain and discuss the district's operation and philosophy.

The Upper Washita Auxiliary is also very active in sponsoring all types of conservation education throughout the 2 counties included in the district. One of their recent and outstanding projects was sponsorship of a poster contest among grade schoolchildren. More than 1,500 posters were submitted by the children. Every school in the 2 counties was represented. Two or 3 members of the auxiliary worked with the children at each school, giving suggestions and supplying them with appropriate materials. The contest was divided into 3 sections; one for 3rd and 4th graders, one for 5th and 6th graders, and the other for 7th and 8th grade students. The 36 top contestants were invited to a special banquet and given cash awards.

A Subscription to This Magazine Should Make a Good Contest Prize or Christmas Gift.

A Challenge Is Met

A Soil Conservation District Hires Its Own Personnel to Make Topographic Surveys for Irrigation Planning.

By HERMAN V. SCHULTZ

IN 1954, irrigation was spreading like an early-day prairie fire in York County, Nebr. This was made possible by the installation of deep wells on individual farms. Requests for technical assistance from farmer-cooperators were growing in number every day. The requests were mainly for complete conservation-irrigation plans. This was the problem confronting the York County Soil Conservation District board of supervisors.

By the end of 1954, more than 100 requests for assistance were on file. Evan Miller, chairman of the board of supervisors, called a special meeting inviting all interested cooperators and prospective cooperators to attend. This interested group was informed that it would be a year or more before the technical staff, assigned to the York District by the Soil Conservation Service, could process the applications on hand. By then there would be double or triple that number of additional requests.

One of the time consuming jobs that slowed down the conservation irrigation planning work of SCS technicians was the making of topographic surveys. Soil conservation surveys had been completed for most of the county. But accurate topographic surveys were also needed for laying out irrigation systems.

It was decided at this meeting that the district would employ personnel to assist in making topographic surveys and would buy its own transit and other surveying equipment. In order to pay the personnel and buy the equipment, the district would charge each cooperator 30¢ per acre for making a topographical survey

Note:—The author is work unit conservationist, Soil Conservation Service, York, Nebr.

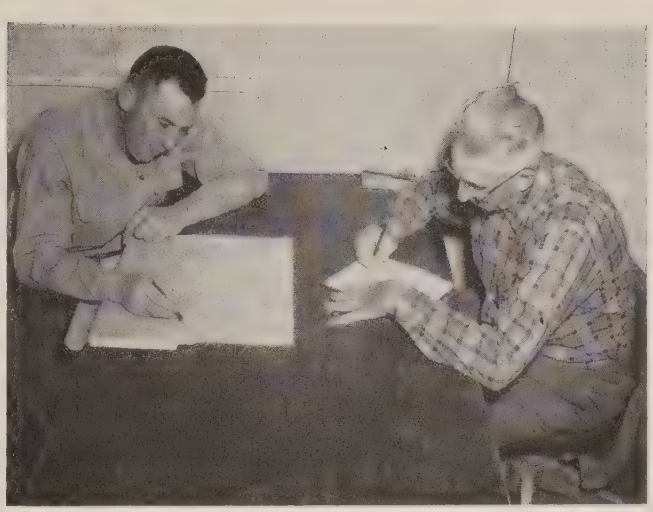
map of his farm. The district agreed to furnish an instrument man and a note keeper. The cooperator was to furnish a minimum of three walkers to serve as rodmen in carrying the stadia boards. Shots would be taken every 100 feet by stadia azimuth. The 30¢ per acre charge would also include cost of district help to reduce the field notes and plot the "topog" maps. The 30¢ per acre charge was only for hiring district employees and purchasing necessary equipment to get the job done. None of the money was used for SCS personnel or equipment.

The York County Soil Conservation District was organized in 1946. Eighty-five irrigation wells were in operation at that time. Engineering help and layout had been confined to that which could be provided by the county agent and his staff. The average deep well will irrigate about 90 to 100 acres.

From 1946-52, 85 more deep wells were installed; an average of about 12 wells per year. This permitted the Soil Conservation Service personnel to keep up with the district workload, including the making of topographic surveys.

Drought started in 1952. Thirty-two wells were installed in 1953, and 83 in 1954. The stampede was on. It seemed as if every landowner and operator in the county had suddenly decided to be an irrigator. That was when the district board decided to hire district personnel to help the SCS technicians.

The board of supervisors of the York County Soil Conservation District.



Merle Kaeding (left) and Art Klute, district employees, complete their notes on topographic surveys made during the day.

Under the new plan of operations, personnel had to be trained for the district-operated crews. This was done by the assigned technical staff of SCS. Work for cooperators was scheduled a week in advance. One or two survey crews worked every day the weather permitted except for June, July, and August. The district's report for 1955 indicates the success of this procedure—19,500 acres had been surveyed. This compared to 19,300 acres for all previous years.

Dry weather extended on through 1956. In fact it was so dry that most farmers disked their cornstalks down so they could survey their fields through the summer months. Applications for assistance kept coming. The district's report of 1956, showed 27,100 acres had been surveyed, maps plotted, and reproductions made for the cooperators. This brought the total acres surveyed to 65,900.

During the 2 years, 1955-56, 500 cooperators were serviced. There are approximately 2,000 operating units in York County. There were many group meetings as each cooperator would call in 1, 2, or 3 neighbors to help with the survey. Art Klute, chief of party for the district says, "Seldom do we survey a farm now when at least 1 or 2 of the farmers haven't helped before."

All requests were processed by the end of 1956. Irrigation wells in the county increased from 285 to 400 by the end of 1955. At the end of 1956, they had more than doubled, totaling 816.

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(GPO)

In spite of this tremendous increase, the technical staff of the Soil Conservation Service was able to complete a conservation plan for irrigation at the time the cooperator received his "topog" map. This enabled him to choose the most suitable location for his well, type of system most suitable (gravity ditch or gated pipe), row direction, length of run, crop rotation, and the conservation practices needed to protect the irrigation system from surrounding areas. It has permitted the district dryland program to be carried out without interruption. The technical staff has been able to give assistance on the farm for such irrigation practices as land leveling, surveying ditch laterals, and drop structures.

This indicates the tremendous service district supervisors are giving their cooperators by providing leadership and using district resources to promote conservation when and where it is wanted.

CONSERVATION CONTRACTORS.—For the past 10 years the Middlesex Soil Conservation District in Massachusetts has held an annual dinner meeting with heavy equipment contractors. The first few years the district supervisors were mainly interested in getting qualified contractors to do conservation work.

This objective was accomplished with such success that contractors in the area are now helping the district sell farmers on conservation practices. Contractors not only sell farmers on conservation, but also help convince farmers that they should become district cooperators and secure the assistance of Soil Conservation Service technicians.

The district now has about 10 contractors who are highly skilled in soil- and water-conservation jobs, and at least another 10 who are anxious to get into this select group.

At these district-contractor dinner meetings, during the past few years, the topic of conversation has centered around ways and means of doing a better job. The contractors offer suggestions to the district supervisors and SCS technicians. The district supervisors and SCS technicians offer suggestions to the contractors. There is a general air of friendly cooperation at the meetings. All parties concerned have one aim in mind; to get more and better conservation on the land.

A typical soil and water conservation contractors meeting consists of about 30 contractors, the district supervisors, SCS personnel, county agent, and ACP county office manager. After dinner, from 7 to 8 P.M., a panel of district supervisors, contractors, county agent, ACP office manager, and SCS technicians answer questions. After the panel discussion contractors sign contracts and everyone visits.

In the field, a typical contractor will follow designs and specifications with a minimum amount of waste motion. He knows what stakes and cut marks mean. He explains to farmers why it is necessary to have a 2 to 1 slope when the specifications call for a 2 to 1 slope. Many of these contractors have now become so skilled at following SCS instructions that little supervision is necessary. It is the general feeling of all concerned that this skill and cooperation in establishing conservation practices is due to the understanding brought about by annual dinner meetings.

—CARL O. CLARK

STRIP MINE RECLAMATION.—The Kentucky Reclamation Association was formed in 1948 by strip mine operators of the State who felt a responsibility to the public to put back into use lands stripped for coal. The primary purpose of the association is stated: "To rejuvenate lands laid waste by strip mining operations."

LOOKING AHEAD, I can visualize thousands of our small watersheds in the condition that God intended them to be: hillsides guarded with a mantle of trees and grass . . . land on the lower slopes and in the valleys protected by other conservation practices that save soil and hold back the water . . . upstream dams, supplementing land treatment, to hold back water when we have too much, and release it when we have too little . . . land in watersheds revitalized; water more plentiful . . . man and nature in harmony!

—EZRA TAFT BENSON
Secretary of Agriculture

DECEMBER 1957

SOIL CONSERVATION

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SOIL CONSERVATION

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

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★ THIS MONTH ★

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CHRISTMAS TREES FROM STRIP MINES.—Trial plantings indicate that the coal mine spoil banks for Cherokee County and other southeast Kansas areas may become valuable for Christmas tree production.

More than 15 thousand acres of land have been stripped for coal in Cherokee County. Other nearby counties have thousands of acres of strip mine dunes. This land has a very low evaluation for tax purposes, or is not taxed at all, and its agricultural value is quite low.

The coal mining companies have tried various grasses and legumes on these dunes. The results were not satisfactory. Sweetclover has given the most satisfactory returns for pasture. Trees, for lumber production or other uses, have been tried, but the results were not encouraging.

The Cherokee County Soil Conservation District, in 1952, provided 2,400 evergreen trees, including several varieties of pines, spruce, fir trees, and arborvitae. These were planted on strip coal land as a field test.

(Continued on P. 103)

Editors are invited to reprint material originating in this magazine.

FRONT COVER.— Robert and Joanne Morse harvesting multiflora rose berries for the Christmas trade, near Westminster, Vt.

—Photo by E. L. Rowe

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

International Range and Pasture Judging Contest

By SELLERS G. ARCHER

ON a rainy day last May, over 500 people moved in groups on the grassy slopes of the Jack Hall ranch near Oklahoma City. They were playing a game designed to teach, in contest form, the hard-to-teach subject of grassland agriculture. They were contestants and observers at the Third International Land, Range, and Pasture Judging contest sponsored by WKY radio and TV stations.

The importance of the event is attested by the fact that there were representatives from 28 States, Puerto Rico, Hawaii, and the five continents, and by the fact that intermittent rain falling throughout the day did not discourage full participation.

Range and pasture conservationists have long thought that there are two basic elements in teaching grassland management. One is the identification of plants. The other is the identification of sites, which includes a recognition of soil, slope, and other conditions that affect the growth of plants. Recommendations for establishing, maintaining, or improving grassland must be based on these two elements.

Educators have long used the contest idea as a teaching aid in many subjects: Witness the ciphering matches and spelling bees, livestock and land judging—and now range and pasture judging contests.

At the Oklahoma City event, FFA boys and 4-H club members were in the spotlight, competing for more than $2,000 in team and individual prizes as well as numerous trophies and medals. But there were other divisions in the contests, too. They were for women and girls, adult men, college students, and foreign contestants.

Prior to the big show, there were hundreds of contests sponsored by soil conservation districts, chambers of commerce, and other civic groups. These contests were held on levels that included members of a club or chapter; clubs within a soil conservation district or county; and districts including several counties. According to varying State rules and the expense money available for taking contestants to Oklahoma City, county, district, or State winners were eligible for competition in the national and international contests.

At the International Range and Pasture Judging contest, team members were separated and put in different groups led by volunteer workers from the Soil Conservation Service, Vocational-Agriculture departments, and other agencies. These groups were led to a set of "fields."

At one, the contestants, working individually, checked pertinent facts concerning each plant marked and numbered. On the score card for that field they wrote each plant's common name

Clarence Kingery, SCS range specialist, (left) gives instructions to contestants at a contest site.

Note:—The author is work unit conservationist, Soil Conservation Service, Cordell, Okla.

and checked whether it was perennial or annual, warm or cool season, climax or invader. A separate card was used for each of the other fields where the site was determined. Also marked was the degree of utilization and treatments needed to maintain or improve the grass.

Finally, the contestants inspected a field to be planted to grass. Land capability was determined from soil texture, permeability, slope, and other factors, which were marked on their score cards. A small trench exposed a soil profile to contestants for examination of texture, permeability, and depth. From this basic information they recommended plants and treatments to be used in establishing a new pasture.

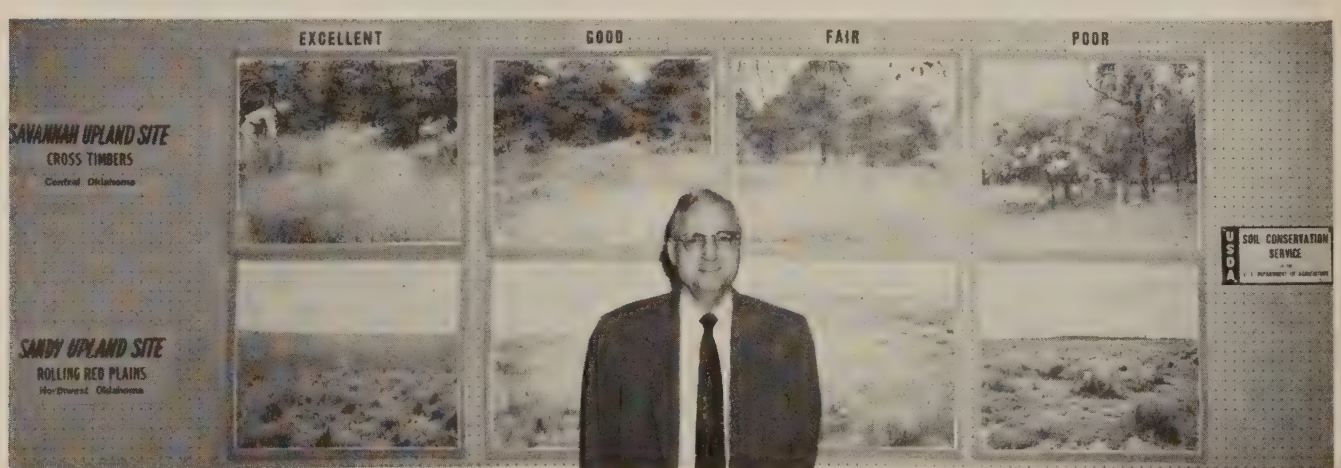
An awards dinner was the commencement exercise of the 2-day school and contest, and dozens of young people and adults walked proudly across the stage to receive from Dr. Oliver S. Willham, president of Oklahoma State University, their degrees in the forms of checks, trophies, and medals.

Oklahoma contestants took a great share of the honors in the range and pasture contest. But teams and individuals from other States, especially Texas and Kansas, won many cash prizes, medals, and plaques.

As other States develop new and successful methods of teaching soils and grassland management, they will place more teams and individuals in the winning column, thinks Edd Roberts, Oklahoma's extension soil conservationist, and one of the originators of the State and national events. On the Oklahoma extension team with Roberts are Clarence Bunch, range specialist, and Dick Chiles, pasture specialist. Cooperating with local groups, they give at least 1-day's schooling a year to 10,000 Oklahoma students and adults. Other personnel in county extension offices, Soil Conservation Service work units, and Vocational-Agriculture departments give training to an estimated 10,000 others. Soil conservation districts, chambers of commerce, and other groups cooperate to provide facilities and give prizes.

Lyle B. Leonard, extension specialist in soil and water conservation, University of Kentucky, is developing plans and training leaders for the inauguration of pasture judging contests. He had one team in the land judging contest at Oklahoma City this year. He wants the students to learn to fit pasture plants to the soils where they are best adapted. And observers were present from several other States that have not yet adopted the contest idea for teaching soils and pasture sciences.

Contestants from States where the types of native pasture plants found in the Southwest are of minor importance are at some disadvantage in the international contest, although many of the plants are found in most States of the Union. There are provisions, however for minimizing the handicap. Illustrated and descriptive booklets issued by the Phillips Petroleum Company help students to learn the identifying characteristics of most of the plants. Many text and reference books outline the basic management principles, which are



Earl K. Lowe, chairman of the Land Appreciation School, before a grass display at the State fair grounds in Oklahoma City.

John Smith, Hammon, Okla., receives trophy for placing first in FFA division from Oliver S. Willham, president, Oklahoma State University.

standard everywhere. Moderate training should enable teachers to give their students the essential background.

On arrival in Oklahoma City, contestants may study displays of the range plants taken directly from the field. On the first day a school is held, contest rules and range management principles are discussed. Field sites and plants, identical or similar to those to be judged the next day, are set up for study. Instructors from Oklahoma State University and the SCS give adequate instruction on the identification of range plants, range sites and conditions, as well as the pasture plants and practices common in the area. A properly trained student from any part of the Nation is not at a great disadvantage in the contest.

Not only is a greater use of the contest principle in teaching grassland agriculture popular in the States; foreign observers like the idea, too. Those more fluent in the English language reported they were impressed, and many hoped to get such contests initiated in their own countries.

For example, Orlando Fontes Lima, from Brazil, was "fascinated", as he put it, at the enthusiasm shown by young people and adults, and by the fact that boys and girls, men and women—all were participating.

When asked if the contest method for teaching land, range, and pasture judging would be used in his country, Lima said that the decision would be made by his superiors in the Ministry of Agriculture. But if the idea is adopted, he said, he thought it would be appropriate to hold the contest on April 15, which is the birthday of Dr. H. H. Bennett, and for that reason is designated by law as "Soil Conservation Day" in the State of Sao Paulo. In Brazil, as in the United States, Bennett is regarded as the father of soil conservation.

Lima is an instructor in agricultural engineering at Fazenda Impanema, which is a federal agricultural training center in the State of Sao Paulo—the only one of its kind in South America, he says.

The program is destined for South Africa too, it seems. T. E. de la Hunt, group conservation and extension officer in the federal department of conservation and extension, of the newly formed Federation of Rhodesia and Nyasaland, was also impressed. He said that he will "make definite recommendations" that land, range, and pasture judging schools and contests be inaugurated for their YFC (Young Farmers' Clubs) and that their technicians be trained to conduct these events.

This new game, that teaches, may be played either formally or informally, with large or small groups, or with groups of differing ages, sexes, or races.

A father and son can enjoy elements of the contest in the home pasture, or two boys can compete in plant identification on their way home from school. Certainly, farm and ranch

T. E. de la Hunt (right), a contestant from Rhodesia and Nyasaland, studies a little bluestem plant with American advisors.

boys in training for a contest spend considerable time in pastures and on the roadside studying pasture plants. For every student who receives formal training, a brother, father, or playmate has some information passed on to him.

Recently the writer saw a 4-H club member and his father strolling across their native grass pasture, stopping to inspect a plant here and there. On joining them the boy reported that his dad didn't know that catclaw sensitivebriar was a legume and added nitrogen to the soil to help the grass grow. Indulgently the father admitted that the plant had been nothing to him but a "devil's shoestring." That afternoon he made friends with many new plants. As the boy excitedly described the characteristics of each plant, the proud father learned.

That afternoon the three of us determined the range site for the pasture, the degree of utilization, the range condition, and made plans for proper use.

In the study it was determined what plants were climax, or the highest order, for the site. When they were absent or scattered, or when they were in a weakened condition, it was natural for the farmer to want to know why and how to bring the grassland back into full production. The SCS technician's work was made easier because of a 4-H boy who was trying to make his club's range and pasture judging team. This is the payoff for the program that reaches its climax in the international contest near Oklahoma City each spring.

The national and international contests represent a cooperative effort among the agricultural agencies, the sponsor, and other private and public groups. Twenty-four committees with more than 100 members divide the preparatory work. Dozens of others are enlisted for special work during the event. But, so well is the groundwork laid that the crowded 2-day schedule runs effortlessly.

Last spring at this meeting Keith Mathers, manager of WKY, summed up the attitude of the sponsor and the horde of voluntary workers: "We are very serious about this work and very jealous of the contests. This opportunity for service is not for sale. We will continue our sponsorship, and you can count on us."

SHOWING YOUR WARES.—"In soil conservation as in show business, you keep your best foot forward and the shoe well shined," says J. T. McLaurin, work unit conservationist, West Jefferson, N. C. When a golf course was built at West Jefferson, Mac saw an opportunity to put his best foot forward—conservationwise.

Calling on Dean Lawrence, a cooperator with the New River Soil Conservation District, whose farm adjoins the golf course, Mac got him to put in stripcropping right against the club's boundary at the ninth hole. As a result, a great many people playing the course, permanent residents as well as summer visitors, have looked at the arrangement and have been intrigued by it.

So many asked questions about it that Walter Godby, manager of the club, asked Mac to explain to him his reasons for arranging the crops in strips. Godby wanted to know so that he could pass the information along to puzzled golfers.

The ninth green of the West Jefferson Country Club with stripcropping in the background.

When it comes to stripcropping, Mac is known throughout North Carolina as its greatest promoter. A big reason for his success in getting stripcropping on so many farms in Ashe County is his use of good public relations. As in this case, he never misses an opportunity to plug stripcropping. He writes about it, talks about it, and shows it off to visitors.

As a result, Mac has induced most farmers, cooperating with the New River district, to practice stripcropping. On farms where there isn't any stripcropping it's usually because the owners are planting alfalfa or have established grass solidly on a grass-base rotation. And this, as Mac points out, provides even more soil and water protection than stripcropping.

—Leon J. Sisk

SOIL COMPACTION BY FARM MACHINERY

By M. L. NICHOLS

No. 29

This is the twenty-ninth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

TECHNICAL advances in agricultural production during recent decades have brought many problems. Production per farmworker has practically doubled since 1940. The resulting overproduction makes control of production, to avoid glutting of markets, a real economic problem. But that is not the only "headache." This rapid increase in efficiency, which has been to a great extent achieved by mechanization, is also bringing other problems. One of these problems is soil compaction.

The causes of soil compaction are complex. With the substitution of tractor power for horses and mules, there was a material reduction in many areas of meadow and pasture. The area in grass, which was a major crop in the rotation when we used animal power, was materially reduced on our best cultivated land. This left the soil more susceptible to compaction and puddling or smearing.

Under modern standards of production efficiency men must handle large units of machinery, using big plows and harrows, three- or four-row cultivating equipment, and heavy harvesting equipment such as combines or cotton pickers. This large equipment means big power units and big power units mean heavy weight for traction and heavy weight means compaction of the soil. Compaction of the soil means reduction of infiltration of water and air. In some conditions this compaction becomes sufficiently serious to materially reduce yields by limiting the feeding area of the roots. The correction of this not only involves machinery changes but may require many adjustments in soil and land management.

The problem of soil compaction by power equipment is a real one wherever heavy tractors or implements are used. At the National Tillage Machinery Laboratory, we find that the problem is nationwide, but its seriousness varies from place to place. Foreign technical literature indicates an ever-increasing consciousness of the seriousness of the problem under the high-pressure use of land in Europe. It is the subject of a major project at the research institutions at Braunschweig, Jena, and Baden-Baden, Germany, and the National Institute of Agricultural Engineering at Silsoe, England. The problem is being studied at the Soils Laboratory at Versailles, France, and the Russians have published a number of papers on this same subject. It is a universal problem of power farming, but the extensiveness of the organized attack in the United States and the careful and systematic work of our colleagues in Europe should enable us to develop satisfactory solutions.

There is nothing particularly new about the reaction of soil to pressure producing compaction; but, the increased use of heavier machinery puts the subject in the category of urgently needed information and it is being discussed as though it were a new subject.

For the sake of simplicity we will ignore the wide variation found in different soils and discuss the reaction of one of the best agricultural soils in the Coastal Plains as a typical case. The Faceville sandy clay loam will serve as an example. Faceville was one of the soils studied by Cooper, Kummer, and members of the SCS operations staff to determine its infiltration rate for irrigation water. This soil, like most good agricultural soils, has a definite structure, which collapses under the heavy pressure of tractors and implements when in moist condition, leaving the soil almost impermeable. The infiltration, which was fairly high in its normal condition, was reduced by packing with tractors

Note:—The author is director, National Tillage Machinery Laboratory, Agricultural Research Service, Auburn, Ala.

and tillage until the soil became practically impermeable at plow depth due to the formation of a plowsole or pan below the depth of plowing. Root formation was limited to a shallow 6-inch surface layer. This compaction reduced infiltration and available water supply. Crops became subject to drought and yields were limited.

Figure 1.—Shows movement of soil particles when plunger is pushed into the ground.

In many cases, due to the fact that a farmer can get over the land so rapidly and easily, he overdoes his cultivation and goes over the land many more times than he did with horses and mules. At a number of experiment stations studies are being made to determine minimum tillage necessary for high production.

Another factor that contributes to compaction is that a soil dries out at the surface and may appear quite solid, while at plow depth it is still moist and plastic. The more moisture there is, the easier a soil compacts; hence, serious damage may be done with little surface evidence. This is particularly true when a wheel of the tractor runs in the furrow in plowing. A little packing and a little slipping of the tire in the moist soil may result in a practically

Figure 2.—Illustrates the formation of a plowsole where a blunt-pointed plowshare is used. (See explanation in text.)

impervious plowsole or traffic pan.

A slipping tire smoothes the soil and seals the pores in the soil beneath the tire by smearing the moist soil into them. It is reported some German farmers are unwilling to use their tractors for spring cultivation because they fear damage to the soil structure. The resultant deterioration of plant growth is attributed by them to be caused as much by the slippage or sliding of the wheels as by the weight of the tractor.

Studies of the effect of puddling under way at the National Tillage Machinery Laboratory at Auburn indicate that this puddling or smearing is a major factor in sealing off subsoil from air or water movement, and evidence that we have gathered to date indicates that smearing or puddling in many cases is a really serious factor.

The technical study of the effect of pressure on soil compaction is an interesting one. Since it goes on underground, usually with little or no evidence on the surface, its study requires special equipment and techniques.

Figure 1 shows soil moving before a plunger which is being pressed into the soil beside a glass plate covered with aluminum powder. The markings on the plate are made by the soil particles scratching the aluminum powder. Some soil is trapped before the plunger and is pushed before it, forming an entering wedge. This wedge pushes soil to the side. The displacement of the plunger is equal to the reduction of soil pores or the swelling of the soil surface. Squeezing the air or water from the soil pores is, of course, compaction; and, stresses and strains of soil movement, such as shown, occur whenever a wheel or track sinks into the soil. Usually the movement is not in such an exaggerated manner as shown by the photo, except where the wheel sinks into very loose soil or mud.

Soil follows definite laws of behavior and to find and understand these laws is the job of the scientist. If we painstakingly study the simple behavior of soil, after many repetitions, and by using the best equipment for viewing and measuring cause and effect relationship, we find there is order in nature.

For example, let us follow the reaction of soil to a dull plowshare when forming a plowsole. In figure 2, we have exaggerated the dullness of the plowshare by making the edge of the share excessively thick so as to see what it does to make a plowsole. The share is moved in the soil beside a powdered aluminum covered glass surface so we can see how the soil reacts by observing the scratches on the aluminum. The thick edge of the share catches some soil and forms a cone or wedge (marked A) and this pushes forward compressing the soil ahead of the plow. The soil, after a certain amount of compression, breaks or shears in definite planes, one of which is shown at C. A low pressure or poor scouring area develops above this cone at E, and the soil sticks to the moldboard at F. Finally, scouring ceases and the entire moldboard is gummed up with the soil moving over soil approximately on a line marked D. On the bottom of the plow the cone presses downward and forward, compressing and smearing the soil in the area G, making a plowsole. The soil at H has become roughed up due to its sticking to the bottom of the cone A and being pulled by cohesion as the cone advances, leaving the furrow rough on the surface but compact and smeared underneath to form a layer with reduced permeability for air or water.

Figure 3 shows the effect of packing of tractor tires on the emergence of peas grown for a

Figure 3.—Uneven emergence of peas caused by packing of wet soil where tractor wheels traveled.

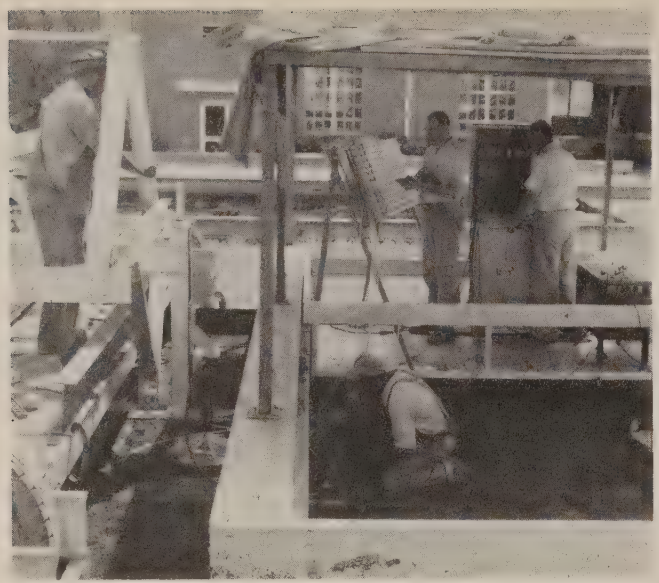


Figure 4.—Some of the technical equipment used to study forces of compaction at the National Tillage Machinery Laboratory.

cannery. The packing of wet, cold soil retarded emergence, so that ripening was delayed and at harvest time some peas were ready, others were not, with the result that the value of the crop for canning was reduced.

Many examples of the importance of understanding and controlling compaction can be pointed out. The problem is receiving careful technical study in controlled laboratories and by simple field trials to evaluate possible solutions. Figure 4 shows some of the equipment for a technical study employing electronic methods to measure stress distributions in the soil, using the Cooper soil pressure cells.

Unfortunately, we have not gone far enough with these studies to give the farmer or the machine designer specific instructions or to set forth limitations for avoidance of compaction on the various soils under various conditions. Since soil management will always depend in large part on the judgment of the farm operator, all we can hope to do is to get sufficient basic information to enable the farmer to plan sound management programs, to intelligently appraise conditions, and to enable the designer to understand physical limitations of soil resistance.

At present, we can call attention to the extreme importance of moisture in compaction or puddling. When the soil has sufficient moisture so that it can be packed densely into a plastic ball, or the moisture is sufficient, so that it can be rolled out into a wire-like form, approximately a quarter of an inch thick, it is too wet for cultivation or traffic. Its general condition to resist compaction, in the long run, can be materially improved in most cases by a good rotation which includes grass or grass-legume mixtures.

It is easy to examine the soil to see if there in any kind of dense layer that has formed at plow depth, which materially reduces infiltration. Removing both ends from a tin can provides a cylinder which, when pushed into soil, so as to hold water in it, enables one to make a reasonably accurate measurement of the rate of infiltration. If the subsoil is permeable and the test shows there is a dense impermeable layer above it, the chances are that there is some kind of a plowsole formed which needs looking into by an engineer or a soil scientist.

PONDS ALONG THE HIGHWAYS

Public Ponds Are Being Developed for Recreation and Utility Purposes Along Maryland Highways.

By JAMES A. SEAMAN

FARM ponds and public ponds along State and National highways are becoming a common sight in Maryland. And the people of the State are enjoying them in many ways. You'll find old and young using them for fishing, picnicking, and skating. Some ponds also serve as a water source for fire fighting.

"We realized several years ago that highway builders were passing up many good pond sites," explains John E. Clark, who heads up the Keep Maryland Beautiful committee. "They pass up sites not only for ponds that would improve the scenic appeal of the highway route, but ponds the people of the nearby communities could use for recreation. Often the road building actually creates good pond sites."

Note:—The author is work unit conservationist, Soil Conservation Service, Bel Air, Md.

So, when the Bel Air-Aberdeen State Highway No. 22 was to be improved, plans included a pond on Bynum Run, just outside Bel Air. Soil Conservation Service engineers designed the pond and supervised its building.

"The basic soil conservation principle was involved here—the principle of proper land use and treatment," Clark pointed out. "The pond area was a swamp. A lot of good land was lying idle because of its wetness. The pond drained all of this wet area. Now, all the land around the pond, aside from the recreational area, is in productive pasture."

A community pond on Route 23 in Forest Hill was started by the Grange. Local residents gave the money to buy the pond site. The Maryland Game and Inland Fish Commission built the pond and stocked it with fish. The grove between the pond and the highway was opened to public use by its owner, The Society of Friends.

An SCS-designed pond near Churchville was also owned by the Grange. When the Grange sold the property, the new owner, Dr. James McFinney gave the pond to the Level Fire Company. The firemen maintain the pond.

"After nearly every fire, we refill our tanks from the pond," Fire Chief Robert Knight said. "It serves us well."

Public pond near Churchville, Md., that is used by local fire company to refill tanks.

In addition to the public ponds scattered along the highways, there are innumerable private ponds that decorate the landscape and serve utilitarian purposes for the owners. Besides those noted, the State Roads Commission, Izaak Walton League, and soil conservation districts have also helped build or maintain public ponds.

Community pond and picnic area near highway in the Forest Hill community of Maryland.

Infrared Photos—T

By GORDO

HAVE you ever noticed the confused look on some people's faces when you mention "watersheds?" It happens too often.

We're likely to forget that many people outside of agriculture have never heard the word "watershed" before. Some aren't sure if it's the old boathouse down by the lake or the new water storage tank at the other end of town.

The dictionary says a watershed is an area drained by a stream or lake. It may include a few acres or several million acres. The idea is still hard to visualize unless folks can see it in one picture.

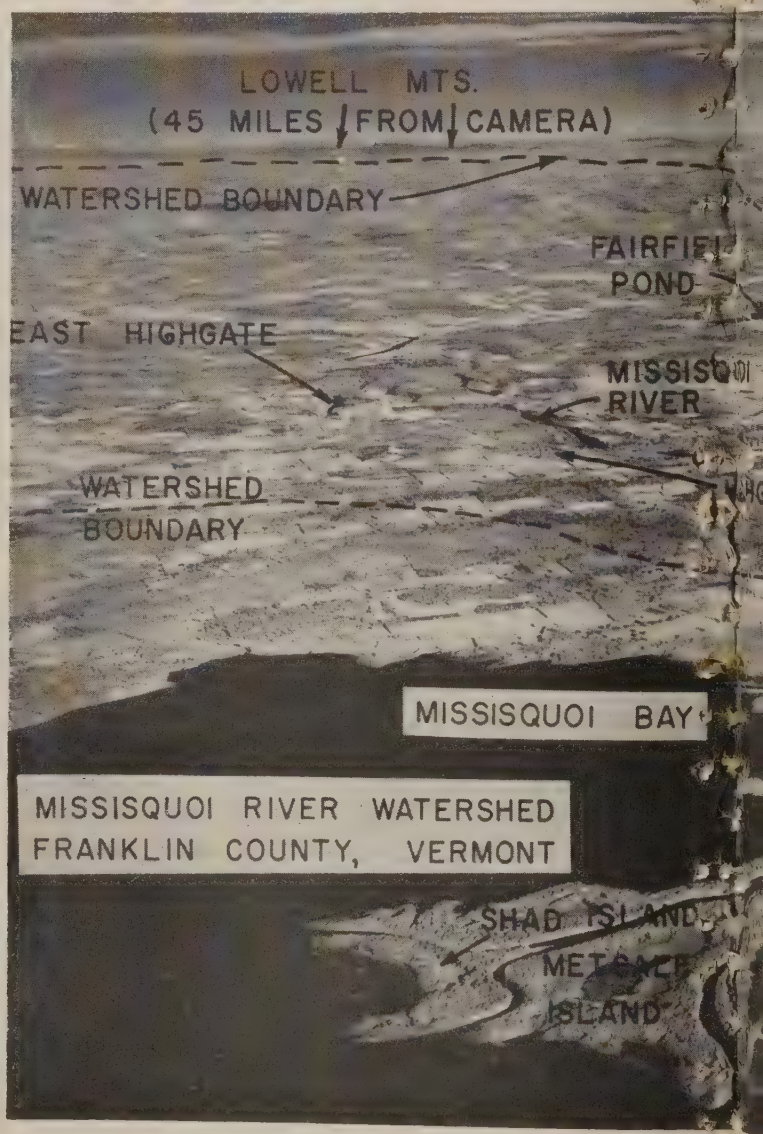
To cover an area of thousands of acres in one photograph, we usually think of a multi-engine plane and a big aerial camera. It is possible, however, to make some interesting photographs covering all or most of a moderately sized watershed by using a small plane and a 4x5 Graphic camera. The only special items needed are infrared film and a filter.

Infrared film has the ability to cut through the distant haze. More important, it has an interesting effect on vegetation and water. Green trees and fields turn to shades of light gray. Streams and lakes show up almost jet black. The contrast brings out details otherwise lost on regular film. Landmarks, 40 or 50 miles away, show good definition. Towns and highways stand out much clearer, too.

For shutter bugs interested in the details of infrared, aerial photography, here are a few do's and don'ts to remember.

You'll need a plane that can easily climb to 12,000 or 15,000 feet. To cover a 35,000-acre watershed you need to be about 10,000 feet above the ground. Wait for a good clear day that is not too cold. The temperature drops about 3° per thousand feet of altitude. If it's a nice comfortable 45° above zero on the ground, it will be a chilly 15° above zero up there. The photos should be made through an open window or door. It could be a little brisk under these conditions.

The film is slow and a red (A) filter must be used. At this altitude the plane flies with fair stability and the ground moves by slowly. A high shutter speed isn't necessary. A standard exposure for this film is one-hundredth second at f 5.6. Be sure you don't use any part of the plane to brace your arms or the camera; the vibration will blur the picture.

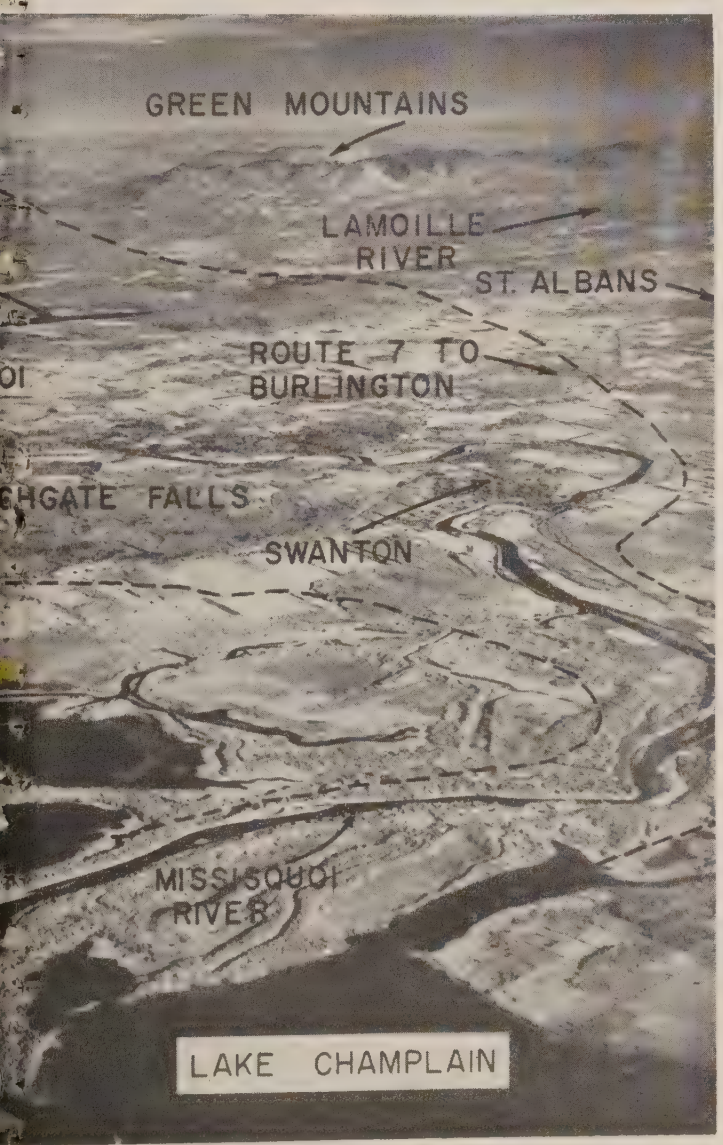


Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

Show a Watershed

S. SMITH

Also, be sure the plane you use will give you an unobstructed view of the land below. Don't include too much unnecessary foreground. Get as close to the edge of the watershed as possible. Be sure you know the watershed boundaries before you fly. Locate some large landmark in the watershed on a map, and take the map along. Be sure to shoot several exposures. One shot will always be better than the others.



To make the photograph even more interesting, outline the watershed area with india ink on a semimatte (non-glossy) print. Locate important landmarks such as lakes, streams, towns, highways, and sites of proposed watershed improvements.

The end-product makes an interesting visual aid for a watershed project. It can be used as a lead photograph for a newspaper story, a center of attraction in an exhibit, or a handy black-and-white slide for a local civic club talk.

LOCAL CONTRACTING

A Progress Report on Local Contracting for Works of Improvement on Small Watershed Projects

How is local contracting under Public Law 566 progressing? This phase of the small watershed program was inaugurated actively during the past year. The experiences, to date, indicate that the procedures devised by the Service for this work are proving to be satisfactory.

The first 30 locally awarded contracts, involving construction costs of $2,668,000 in Federal funds and $188,000 in local funds have been encouraging. Two contracts have been completed without any difficulties and with a remarkable degree of success. Floodwater-retarding structures and channel improvements are the principal types of work included in the 30 contracts.

Contracting organizations in 12 cases were soil conservation districts, in 9 cases special purpose flood control and water conservation or improvement districts, in 1 case an irrigation district, 2 by municipalities, 4 by county governing bodies, and 2 by drainage districts.

The first construction to get underway was a channel improvement project in Delaware. The contracting organization was the Bear Hole Tax Ditch, an authority created under State law. The State soil conservation committee was the local sponsoring organization. This project, which involved channel improvements of 27 miles and 64 erosion-drop structures, was started in September 1956, and is scheduled for completion in August 1958. The Service is contributing approximately $105,041 and the local organization approximately $67,000. The job is proceeding on schedule and only minor revisions have been made since its start. All parties to the project seem to be satisfied with the progress to date.

Work for one floodwater-retarding structure in the Hatch Valley of the North Salem Arroyo Watershed Project of New Mexico was contracted by the Caballo Soil Conservation District. It was completed at a cost of $34,893.56. This was the district's first experience with construction contracting, but results were satisfactory. In both the Delaware contract and the New Mexico one, the Service provided engineering and inspection services, as in most other contracts to date.

Where the local contracting organization has resources and experience, it is encouraged to use its own engineers and inspectors, as on the Turkey Creek Watershed Project in Texas. Here, a contract of approximately $62,000 ($32,000 Federal—$30,000 local funds), has been completed by the Fort Bend County Drainage District. This organization had been operating for a number of years and used its own engineers and inspectors on this job. SCS representatives checked the job occasionally, as needed in line with Service policy. The drainage district procedures and practices of administering a contract were followed with only minimum modifications to meet SCS and Federal requirements. The sponsoring local organizations of this project are the Coastal Plain Soil Conservation District, Fort Bend County Commissioners Court, and the Fort Bend County Drainage District.

In the Cummings Creek Watershed Project of Texas, 31 floodwater-retarding structures are to be built. Eight had been advertised and bids were opened by July 1957. Fifty interested persons attended bid openings. Bids received were in line with estimates. Construction costs for the first 8 structures are estimated at $380,000. The sponsoring organizations are: The Burleson-Lee, Bastrop-Fayette, Colorado, and Austin-Washington Soil Conservation Districts; the Lee and Fayette County Commissioners Courts; the Cummings Creek Watershed Association; and the Lee-Fayette Counties-Cummings Creek Water Control and Improvement District. The latter is the contracting organization. The chairman of the board of directors of the Water Control and Improvement District, a farmer, is the contracting officer. Legal assistance is provided by the two county judges.

Much more could be written about progress in other places, especially on projects in Illinois, Iowa, Louisiana, Oklahoma, South Carolina, West Virginia, and Utah, where progress is well along in contract stages. The program is gaining interest all the time and experiences gained are bringing simplification of procedures. The initial work on the part of Soil Conservation Service and local representatives has taken considerable time but has proved worthwhile. On the basis of experience so far it is believed that local organizations can and will do a good job of contract administration after they have some experience.

—ALVIN C. WATSON

A Subscription to this Magazine Should Make an Excellent Christmas Gift for a Conservationist

GOOD FISHING

By CAL L. ROARK

THERE are about 40,000 farm ponds on district cooperators' farms in Tennessee, and nearly all of them are stocked with bluegill and largemouth bass. These ponds provide a lot of good fishing for the farmers who built them; many furnish sport and fish for town and city dwellers and extra income for the farmers. It is a common custom, in some localities, for city anglers to pay a small fee for fishing privileges in farm ponds.

G. E. Horn, chairman of the board of supervisors of the Davidson County Soil Conservation District, has four ponds on his place. All of them are stocked with fish and are fertilized regularly. Horn has made many friends and has taken in quite a bit of cash by allowing people from nearby Nashville and other communities to fish in his ponds. Here is his story, in his own words, about the first and most popular of his fish ponds:

G. E. Horn (right) and Fred Adams at the deposit box near one of Horn's fishing ponds.

"This pond was completed in 1951. It was stocked with bluegill that fall and with bass in June 1952. The pond was opened for public fishing in May 1955. There was a lot of private fishing for 2 previous years, but people both-

Note:—The author is State soil conservationist, Soil Conservation Service, Nashville, Tenn.

Horn fertilizing one of his fish ponds.

ered me so much, calling and getting permission to fish, that I put up a box and allowed the public to fish. The take from the box is from $500 to $1,000 per year.

"Some may not pay, but the honest ones do and my loss is not great. I would rather trust the people and have faith in my fellowman than gather that fraction of a percent that I may lose.

"The lake was largely excavated, as there were no hills to work between, making it cost $4,000. It covers 3½ acres. It has a 3½-inch drainpipe with a trickle tube. The water is piped out for stock water.

"The multiflora rose fence around the lake is 4 years old and is good. The banks are in fescue sod and areas between the bank and the rose fence are filled with shrub lespedeza and sericea lespedeza.

"I fertilize this pond, as well as my others, regularly to help make better fishing. The fertilizing is done simply by having someone row me about over the pond in a boat while I pour fertilizer from a bag into the water."

WIND EROSION IN SOUTH CAROLINA.—The State office of SCS reports that nearly 14,000 acres of crops were planted in strips for wind-erosion control in the coastal plains section of the State this year. Most of the farmers who tried wind-stripping are enthusiastic about the results.

CHRISTMAS TREES

(Continued from P. 90)

In this test only the shortleaf and Virginia pines survived satisfactorily, though the white pines had fair survival. Since then all of these trees have made an excellent growth. These varieties seem to have good possibilities as stabilizing vegetation.

Better quality soil on the test plots has helped in getting satisfactory survival and growth. In mining this land, the operators placed the topsoil over the sterile shale and rocks. The usual practice is to place the topsoil in the bottom of a trench, and then to cover it by the sterile shale and rocks. The result is a very poor quality soil material for growing vegetation.

A few trees were cut, from the trial plantings, for Christmas trees in 1955 and 1956. In 1957, a good harvest should be made.

Virginia pines, 5 years old, on strip mined land in Cherokee County, Kans.

All things considered, the most plausible solution for the strip pits problem in southeast Kansas seems to be Christmas tree production. However, better results would be obtained if the mining companies placed the surface soil on top rather than covering it with rock and shale. This project will take years to develop but could prove profitable in time.

—Roy E. Clegg

SECOND-GROWTH TIMBER.—The widespread belief of some wood users that second-growth timber necessarily produces second-rate lumber is ill-founded, according to Benson H. Paul of the Forest Products Laboratory, Madison, Wis.

"Second-growth can, and often does, yield first rate wood—sometimes better than virgin timber harvested from similar land," he said.

They Don't Get Away

A Maryland District Keeps Most Cooperating Farms in the Fold by a Systematic Follow-up Program When Farms Change Owners.

By GROVER C. ZIMMERMAN

THE Carroll Soil Conservation District claims to have more cooperators applying conservation plans to their farms than any other district in Maryland. It's the State's only soil conservation district paying three affiliate memberships to the National Association of Soil Conservation Districts. That's because it's Maryland's only district having more than 1,000 cooperators. The district has always had a 100 percent record in paying both national and State association dues. It has more than 1,100 active cooperators out of a possible 2,650.

The key to this record is the district's plan of checking with each new owner as soon as a farm changes hands. Because of this follow-up plan, 88 percent of the new owners of previously cooperating farms continue as district cooperators. Ten percent of the new owners of previously noncooperating farms become cooperators. So a net loss of only 2 percent in cooperators results from farm transfers in the Carroll district. And, of course, farmers not involved in farm sales are continually coming into the fold as district cooperators.

As elsewhere, the turnover of farm ownership has been a problem in the Carroll district. In 1956, for example, 233 farms in the district changed hands. That's almost 10 percent of the district's total number of farms. In the first half of 1957, transfers involved 91 farms. The turnover seems to be leveling off, however, during the past few months.

The Carroll Soil Conservation District's board of supervisors faced up to this turnover problem in 1955. Their solution was that the board would have to make it a duty to check up on all farm transfers.

When the other supervisors pleaded they were too busy to take on any added chores, Raymond P. Buchman agreed to undertake the job. He had been a supervisor since the district was formed in 1944, and had been its treasurer since 1946. Buchman accepted the new duty, though he wasn't exactly what you'd call idle, either. He had a big turkey farm. True, he was gradually withdrawing from full-time management of the farm and turning the job over to his son-in-law, Jesse W. Heird. But he is still quite busy with farm affairs, and he has other things to do. For example, he's a vice president of the Hampstead Savings Bank.

This is how Buchman operates: Each Monday he goes to the Carroll County courthouse in Westminster and gets a list of the week's farm transfers. At the district's office he checks the list to note which farms have been

Buchman gets list of week's farm transfers from Mrs. Russell Lindsay, county transfer clerk.

Note:—The author is work unit conservationist, Soil Conservation Service, Westminster, Md.

cooperating with the district. The office keeps a card index of every farm and revises it weekly. It also keeps a book showing farm ownership changes.

On Tuesday, Buchman sets out to visit the new owners. He goes first to the farms that have been cooperating with the district.

"Timing has much to do with the success of this plan," Buchman stresses. "The idea is to get to the new owner before he can undo any of the conservation work already on the land, or before he starts a new farm enterprise that doesn't suit the land. When you get to the new owners in time, most of them continue the conservation plan already in effect. A few change the plan slightly to make it fit the kind of farming they want to do."

Buchman next visits the new owners of farms that had not been under cooperative agreement with the district. If the new owners live in the same area, he visits them the same day regardless of the previous status of the farm. This saves travel.

When the new owners agree to practice conservation, Buchman directs them to the Westminster SCS office, source of their technical help in carrying out their conservation program.

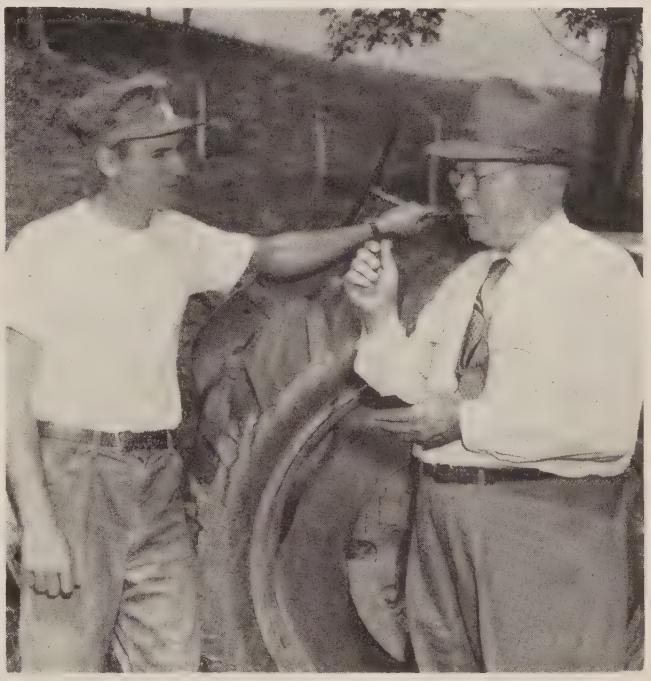
"If the new owner had been a district cooperator before, my job is easy," Buchman says. "He already is familiar with the district program. He knows the kind of help a cooperator gets from the Soil Conservation Service and other agencies. He realizes the value of a conservation program and is eager to continue as a conservation farmer.

"When the new owner has never been a district cooperator, my task is a little more involved. First I talk with him. I tell him the benefits of conservation farming. We walk over the farm together and note what conservation measures are on the land. I explain what each measure does. If it's a farm that hasn't had a conservation plan, I point out the erosion that has occurred and explain how it robs him. Often we go to a cooperating farm where he can see what the conservation practices look like and what they do.

"Sometimes I get no response. I feel discouraged. But later on, I've learned, the chances are good that the new owner will go to the Soil Conservation Service office and ask for help on a conservation plan. He has thought it over and decided that, after all, he needs a conservation program.

"There are times, of course, when the new owner isn't home when I call. So I have to return. I may have to spend 2 or 3 days a week in making these visits."

Buchman says he finds the people friendly and courteous even when they refuse to go along with conservation farming. The most frequent objections to a conservation plan: "I don't like those crooked rows"; and, "I don't want to have anything to do with the government."



Buchman (right) finds it easy to sign up John W. Harbaugh, a newcomer, as a district cooperator.

Buchman finds that a lot of city folks are buying farms to get out into the country. The men continue to work in town. Usually the city people make good farm managers, Buchman says. "They're nearly always interested in conservation," he states. "They want to know all about it."

The supervisors of the Carroll district are convinced that this follow-up effort is not only worthwhile but is necessary. They believe that this system is one reason the district has won three Goodyear awards.

"We have to do something to enroll the new farm owners," Buchman says. "Otherwise the conservation measures already on the land will be neglected and wasted. All the time, effort, and money put into them will go down the drain. Conservation will slide backward instead of moving forward.

"Other districts could do the same kind of follow-up work," Buchman believes. "Most district boards have a member who can devote time to it. Of course, our plan might not be the best. It's not the only one. Other districts may prefer to try a different method. But the responsibility is there. We can turn that responsibility into an opportunity—an opportunity for greater service in the cause of soil and water conservation. I know of no greater service, nor of one more urgently needed."

Face Lifting in South Dakota

Earth Moving or Soil and Water Conservation is a Major Enterprise Among Soil Conservation District Cooperators.

By C. D. BREHM

THE land surface of South Dakota is literally receiving a "face-lifting" through the construction of such soil- and water-conservation measures as terraces, diversions, stock-water ponds and dugouts, land leveling for irrigation, waterspreading, and improvement of irrigation and drainage systems. All of these operations require the movement of soil and are changing the topography of the State considerably.

Soil conservation district cooperators are now among the largest dirt moving groups in the State. Furthermore, succeeding years will likely show an increasing amount of earth moving for soil and water conservation.

Last year, (1956), 12,989,145 cubic yards of earth were moved on soil and moisture conserving practices in this State. About 8 million cubic yards were moved in the construction

Note:—The author is State conservation engineer, Soil Conservation Service, Huron, S. Dak.

Terrace construction with modern equipment in South Dakota.

Cutting a field to grade in the process of land leveling for irrigation in South Dakota.

of dams and dugouts for stock water. These ponds also afford opportunities for fish stocking and for migratory waterfowl.

Terracing, as a practice, is new in South Dakota. Yet, a little more than 2 million cubic yards of dirt were moved for terrace construction. This practice is likely to increase greatly during the next few years.

Outlets and waterways do not require a great amount of earthwork construction, but 400,000 cubic yards were moved for this practice. The shaping and filling of gullies to control runoff water is another conservation practice that will become greater in future years.

In central and western South Dakota, the practice of waterspreading on rangeland to provide additional hay is becoming popular and provides a substantial return to the rancher. About 400,000 cubic yards of dirt were used in the construction of diversion dams and dikes that divert and handle runoff water on waterspreading systems.

On irrigated farms, about 400,000 cubic yards were moved in leveling. This practice provides immediate returns to the irrigator by helping to get uniform stands of crops, more efficient irrigation, better drainage, and therefore greater cash returns. Its use is likely to increase greatly.

A little more than 200,000 cubic yards of earth were used in erosion control, detention dams, irrigation ditches, roadside erosion control, drainage, and spring developments.

It's difficult to realize just how much work is involved in the moving of 13 million cubic yards of earth. If all of this soil were placed in one large earthfill, visualizing the amount might be easier. If a dam 30 feet high were to be constructed with a 15-foot top width, and side slopes of 3 to 1 and 2 to 1, this dam would have a bottom width of 165 feet. Constructing a dam of this size and using the 13 million cubic yards of earth would make this structure about 25 miles long. A dam this size in South Dakota would be very noticeable to everyone.

This big soil moving operation did not just happen. In addition to the technical help provided by the Soil Conservation Service and cost sharing assistance from the Agricultural Conservation Program, contractors played a major part. In many cases, the contractors owned only two or three pieces of earthmoving equipment, but operated throughout the year. Some of the work was performed by farmers or

About 8 million yards of earth were moved last year in constructing ponds and dugouts similar to this in South Dakota.

ranchers, using their own equipment. This shows that small quantities of earthmoving per structure can become almost mountainous when many small structures are completed and the efforts of everyone are combined.

All of these practices mean that South Dakota farmers and ranchers are making tremendous efforts to store, utilize, and manage runoff water. The dry periods of past years have emphasized the need for dependable stockwater supplies and the need for supplemental irrigation. The conservation of moisture on cropland is also highly important. Practices that hold water and make it available to growing plants can mean substantial benefits to everyone. In some cases, it may mean the difference between a short crop and a complete failure. In areas of rolling topography, conservation measures not only encourage more rainfall to enter the soil, but also prevent serious erosion of the soil.

It is expected that the amount of earth moved in 1956 will be greatly exceeded in future years. The miles of terraces are increasing rapidly and this cubic yardage may eventually exceed the earth used in dams. Many more outlets and waterways will be shaped, as they are a key practice in many conservation plans. Waterspreading is very successful, and additional projects will be constructed. As erosion and flooding become more serious, more erosion control and detention-type dams will be utilized.

Between Tide And Marsh

By JOHN N. SELBY

W. CALVERT CULLEN put $22,500 into draining 235 acres of his truck farms near Painter, on Virginia's Eastern Shore. And he'll tell you he's glad he did. He quickly got it all back in bigger and higher quality yields of Irish potatoes and snap beans.

Cullen had a double-barreled drainage problem on a 155-acre neck of potato land; the ocean was on one side, a marsh on the other. When gales whipped up high tides, salt water damaged his land and crops. When rains were heavy, fresh water lingered on his farm and again water damaged his soil and crops. To get the fresh water off, Cullen had crisscrossed his fields with open ditches 4 feet deep. The ditches hampered normal field work, while failing to keep the salt water out.

Cullen asked the Eastern Shore Soil Conservation District for help. The district supervisors called in SCS technicians, who went over the land with Cullen. With their help, he prepared an overall soil- and water-conservation plan. A private contractor did the work.

The first step was to solve the drainage problems. Cullen did that by building an earthen dike 3,700 feet long and 6 feet high along the marsh side of his farm. He built a similar dike 600 feet long on the ocean front.

Then he installed four circular, cast iron tide gates in the dikes. The gates do the neat trick of automatically controlling the water. If the tide comes up, the gates keep the salt water out. If there's too much rain, the gates let the fresh water out. If heavy rain and high tide come at the same time, a ditch 3 feet deep inside the dike holds the fresh water until the gate can open to let it out. Spoil from the ditch went into the dikes.

To drain the fresh water, Cullen installed

Note:—The author is soil conservationist, Soil Conservation Service, Accomack, Va.

1,850 feet of 8-inch agricultural tile mains, 6,700 feet of 6-inch laterals, and 1,500 feet of 4-inch laterals. That took care of 60 acres that had been causing trouble in the 155-acre neck. To keep salt water out of the tile, Cullen put small, circular cast iron gates in some of the mains that emptied into the marsh.

This drainage system let Cullen fill up all of the open ditches but two short ones. They're used now as outlet ditches.

After that, Cullen took a breather to see what would happen. Potato yields jumped. They went from 100 to 150-165 hundred-pound bags an acre. Quality was up, too. A difference in quality can mean $3 a bushel instead of 75 cents.

When Cullen completes his planned irrigation system, he looks for a yield of 300 bags an acre. That's what he has been getting on irrigated land of another farm.

Pleased with results, Cullen completed the drainage job. He put in 17,000 more feet of tile. That took care of another 78 acres.

Next, he turned to his nearby farm where he has 75 acres in Irish potatoes and snap beans. There he had the same drainage problem on 40 acres of extremely wet Falsington fine sandy loam soil. That soil is able to produce potatoes and beans early. The only trouble was that high tides and excess fresh water sometimes prevented early planting.

Cullen built an earthen dike 3,000 feet long and 6 feet high on the marsh side. That was the only side affected. Spoil taken from an inside ditch made the dike. The ditch holds excess fresh water when it can't get out. Two tide gates control the water.

Cullen finished the drainage job by installing 24,000 feet of tile in the 40 acres. He cut 600 feet of outlet ditches 20 feet wide. The ditches are in the marsh, and they're out of the way of farm operations.

All the dikes were designed to hold back salt water that sometimes rises 4 feet above mean high tide. These dikes should take care of everything but the most violent hurricanes.

Benefits of the tile drainage system are not limited to the actual acres tiled. Benefits show up all over the farm.

By tiling, Cullen was able to do away with nearly all open ditches. That has meant greater efficiency in the use of equipment and manpower. It has reduced turning time and wear-and-tear on equipment. There's less wasted acreage in ditch banks and turn rows.

No longer is Cullen's well-drained soil kept wet by adjacent poorly-drained soil. The tile drainage has helped both kinds of soil. With his tile drainage system installed, he is now able to plow the whole farm at one time; no more dodging around wet spots, no more returning to plow the wet spots as they dry, one after the other.

Likewise Cullen can now cultivate and harvest his whole farm at once. He knows that if it rains, his crops won't be drowned out by standing water. He knows too that he can harvest his crops even under fairly wet conditions.

With the drainage job finished, Cullen doubled potato and bean yields and quality improved. Now he can get the early crops that bring premium prices.

Drainage, though, is not the only part of his soil- and water-conservation work.

"I keep the land in good condition by growing soil-improving crops," he explains. "I grow only one cash crop a year on the same soil. After I harvest the beans and potatoes, I plant sorghum. In the fall I disk the sorghum into the topsoil. Then I plant rye as a winter cover crop. I turn the rye under in January. Then I prepare the land for the new crop of potatoes and beans.

A 30-inch tide gate on the Cullen farm keeps salt water out but lets fresh water drain away.

"I fertilize heavily to restore the plant food that high yields take out of the soil. At planting time I put down 2,000 pounds of 5-10-5 an acre on potatoes and 700 to 900 pounds of 5-10-5 on snap beans.

"With these sensitive truck crops, you also have to keep a sharp eye on the lime level. A slight change one way or the other can make a big difference in yield and quality. A lime level of 5.2 to 5.3 is best for our Irish potatoes."

The Incinerator is Gone

Farmers Near Carlsbad, N. Mex., Have Put Cotton Gin Incinerators Out of Business by Using All Gin Trash for Soil Conditioning.

By W. H. ATKINSON

THREE years ago an incinerator to burn gin trash was a standard item at all cotton gins in the Carlsbad Soil Conservation District of New Mexico. It is no longer standard equipment. The incinerator is gone, because all gin trash now is being put back into the soil from which it came. Glenn Brown, who farms 215 acres near Loving, N. Mex., was greatly responsible for this change.

Brown, a cooperator with the Carlsbad district, was not the first to put gin trash back on the land, but he was the first to do it on a large scale in this district. The farm Brown purchased in 1953 was not yielding as he thought it should. Water was being wasted, the land was poor and hard to cultivate. He thought this could be corrected, so he set out on a conservation plan that would improve all agricultural operations on the farm.

The conservation plan included land leveling, soil building, water management, and crop selection. In the soil building phase, the gin

Note:—The author is work unit conservationist, Soil Conservation Service, Carlsbad, N. Mex.

Gin trash loaded for hauling to nearby farms for soil improvement.

Glenn Brown

trash first entered the picture. Leveling had removed top soil. The exposed subsoil was hard to plow, took water slowly, and yielded poorly. Not having enough barnyard manure to do the full job, Brown remembered the gin across the road, where all gin trash was being burned.

Supplementing the barnyard manure with gin trash and commercial fertilizer was the conservation practice that Brown thought should do the job of improving his soil. Many farmers suggested that he was just filling his farm with weeds, grass, diseases, and insects; but, Brown kept right on hauling gin trash. He applied load after load to the cut areas, plus some manure and commercial fertilizer. All was turned under and allowed to decompose. None of the ill omens came true and after a year Brown's yields had increased from 1½ bales of cotton per acre to 2½ bales per acre. The soil's workability had greatly improved. Water went into the soil much more rapidly, and a person could not tell the cut areas from the filled areas.

The results were so good that this author wrote an article for the local papers and almost lost a friend. The story is this: Brown was the sole taker of gin trash in his first year's operations, but after the news article appeared there was such a demand for the gin trash that it had to be allotted to a farmer according to the number of cotton bales he had ginned. Brown had to line up with the rest of the farmers and take his turn.

"All because of your article," he says. This I hope is true, although I believe that "seeing is believing" is the true salesman.

Brown has okayed this article, so he has no one but himself to blame if he puts more incinerators out of business.

REVIEWS

SOIL: The Yearbook of Agriculture. 784 pp. Illustrated. 1957. Washington 25, D. C.: U. S. Government Printing Office. $2.25.

THIS book was planned and written cooperatively by workers in the U. S. Department of Agriculture and in the State land-grant colleges. It is designed to tell the facts about soil use and management and explain the principles applicable in the United States. Readers may find it a useful reference for several years to come.

The authors aimed to cover soil management for the major kinds of soil and kinds of farming in this country. The emphasis is upon good combinations of practices and the reasons for them. The book cannot cover every field and garden in the United States, but it does include the basic practices. Although it lays a useful background for up-to-the-minute local bulletins and recommendations about details, it is not a substitute for them.

Although readers may begin anywhere, the chapters are arranged in approximate order for the easiest reading of the whole book, beginning with the more fundamental concepts that are basic to the applications described later on.

First of all, the reader is shown the significance and place of soil management within the broad field of agriculture and the highlights of its early historical development. Since the application of science accounts for the recent great advances, the authors try to show how new scientific principles are developed.

Second, the reader is shown what soils are and why there are so many kinds. Next, the basic principles of their behavior are displayed, especially how soils take in, store, and release

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the nutrients, water, and air that plants need for growth.

Third, the authors have set forth practical methods for accomplishing specific objectives in soil management, such as liming, tillage, fertilizing, controlling moisture, preventing erosion, and so on.

Fourth, the separate practices are brought together into systems of soil management to show how they support one another. The requirements and methods for developing farm plans and systems of soil management for high production with conservation are set forth.

Fifth, the opportunities for improved systems of soil management in the United States are explained broadly in a series of chapters for 15 broad regions of the United States. Some readers may want to begin here, with the region they know best.

Sixth, soil management systems for forest trees, gardens, and a few special crops, that have requirements somewhat unlike those for the general run of field crops, are summarized in a group of chapters that follow the regional ones.

Finally, the book includes a brief glossary of special words and phrases used in writing about soil management.

Big as it is, this book has at least four limitations:

First, it cannot be entirely up-to-date by the time the reader sees it. Many months were needed to write it, and several more to see it through the presses. Then, it must find its way to the reader. In the meantime the world we live in has been changing. Economic problems change; laws affecting agriculture are changed; scientists continue their research; and technology finds new ways to do things.

Second, the book is far narrower than its title suggests. It deals with soil management and touches but very lightly on the many other aspects of soil science.

Third, any book like this is written for many people. Rarely can it answer all the questions on a *specific* farm or garden. We have millions of farms in this country, and more millions of gardens, on nearly as many kinds of soil, if we take account of every difference between all of them, including the natural differences and those made by previous use. And the possible soil uses in a continental country like ours are nearly beyond count.

Fourth, this is not a world book. Although world experience has been drawn upon considerably, especially that of Western Europe, the focus has been entirely on the continental United States.

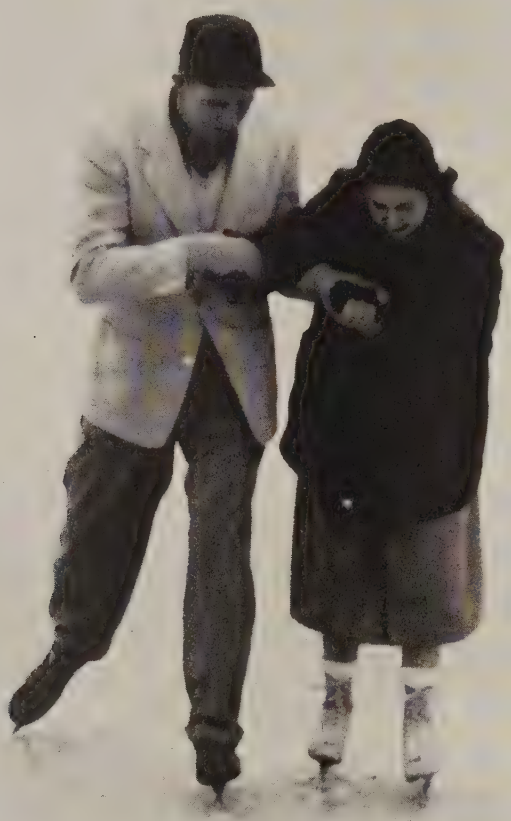
Probably this reviewer had too much to do in outlining and helping with the book to criticize it objectively. I think it is a good book. As in any such book prepared by over 140 authors scattered throughout the country, some parts are better than others. Because of space limitations, charts and pictures are too few.

It is a book for study and reference, to be used I hope, by many farmers and gardeners, and certainly by every soil scientist and soil conservationist. —CHARLES E. KELLOGG

WOODLAND MANAGEMENT.—A 57-year study of 3 plots planted to red pines in 1900, at the North Central Experiment Station in Minnesota, shows that an acre of well-managed forest can bring the owner an annual income of $12 per year. The records, kept since 1915, show annual growth from 452 to 560 board feet per acre. This is about 3 times what should be expected from an unmanaged natural stand.

CONSERVING WATER.—We must do a great deal more to conserve our supplies of water. We have only just begun to use soil properly to conserve rainfall. Much of our present use of irrigation water is wasteful.

EZRA TAFT BENSON
Secretary of Agriculture



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SOIL CONSERVATION

JANUARY—1958

VOL. XXIII—No. 6

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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—EDITOR

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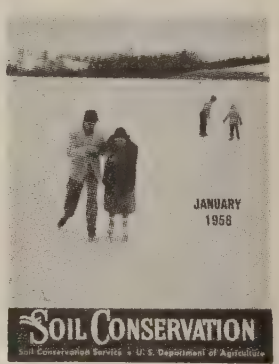

FRONT COVER. — Ice skating on a conservation farm pond in Mercer County, W. Va.

—Photo by John H. Myers

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Farm Hunting Deluxe

By Combining a Hunting Club with Regular Operations a Maryland Conservation Farmer Beats Anything the Indians Ever Had

By HAL JENKINS

PAUL PEARSON, young Marylander who conservation farms about a thousand acres in Montgomery County adjacent to the District of Columbia, has combined a hunting club with the regular operations of one 256-acre farm.

He and his partner, John C. Adams, a real estate and insurance man, call it the Onondaga Club after the Indian tribe that long ago hunted the Potomac Country.

But the Onondaga Indian hunters never had it so good.

Present-day "Onondagas" get the free service of guides and well-trained hunting dogs. They hunt ringneck pheasants 6 months of the year by appointment. The club dresses and quick-freezes or smokes the birds bagged, or delivers them to nearby Normandy Farm Restaurant, for the ministrations of Antoine, Chef de Cuisine, whose Onondaga specialties are Pheasant Saute Chasseur and Pheasant Flambe au Whiskey.

Pearson and Adams feature pheasants because ringnecks normally don't thrive naturally in the area. Ed Mougin, Onondaga's preserve manager who has been a breeder and trainer of hunting dogs for 25 years, stocks the farm with pheasants daily.

But other wildlife abounds naturally in the ideal habitat that has been created on the farm. The club offers hunting for quail, rabbits, and squirrels in season. Hunting for Chukkar partridge and mallard ducks is planned.

Pearson, a supervisor of the Montgomery Soil Conservation District, emphasizes that the farm

Note:—The author is information specialist, Soil Conservation Service, Washington, D. C.

Onondaga Dash points a pheasant for Paul Pearson in a contour strip of corn.

is a working farm. "We plant, till, and harvest crops just as we do on our other farms," he said. "Principal crops are corn, silage, and hay."

Pearson said, "This farm, formerly owned by Lathrop Smith, also a supervisor of our soil conservation district, had a good conservation plan in effect when we took it over about a year ago. All we've done is to make a few changes in the basic plan, with the help of Fred Hazen, SCS technician assigned to the district, and our State wildlife experts."

Pearson explained that all operations are carried on in a way to benefit wildlife but not at the expense of the other farm enterprises. "For example," he said, "we harvest corn both by picker and by cutting and shocking. This gives variety to the food and cover pattern.

"On a modern farm, wildlife is a creature of edges—edges of the cultivated fields," Pearson continued. "And we've got edges galore here—miles and miles of them; and, we have plenty of food and cover—all on the contour."

Pearson is using 12 different mixtures of grasses and legumes. The major plants are barley, vetch, white Dutch clover, sorghums, sudangrass, millet, soybeans, and buckwheat. "These plantings provide excellent wildlife food and cover in addition to crops for harvesting and turning under as green manure," Pearson said. "In some fields we grow 3 crops a year."

Other conservation practices on the farm include 14,000 feet of multiflora rose hedge; 200 feet of stream channel improvement; a half-acre pond; 6,000 feet of waterways; 77 acres of contour stripcropping; and 15 acres of woodland improvement.

Except during the morning and evening peak traffic hours, Onondaga is just about a 30-minute drive from the Nation's Capitol. It is in the heart of an area where farming, although still the major business, is threatened by the urban encroachments of Washington's expanding metropolitan area.

Making the hunting club a part of the farming operation, complete with clubrooms in the farmhouse where Pearson, his wife, and two small daughters live, may turn out to be an experiment in land use that will successfully blend the interests of farm and city people.

That's the hope of conservation farmer Pearson and businessman Adams.

Aerial view of the Pearson Farm.

BRACKISH WATER FOR SUPPLEMENTAL IRRIGATION

By J. LUNIN and M. H. GALLATIN

No. 30

This is the thirtieth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

THE interest in supplemental irrigation in eastern United States has been demonstrated by the rapid increase in irrigated acreages during the past few years. This expansion has been complicated by the lack of adequate fresh water supplies in Seaboard States, especially along the coastal areas. Many farmers in these areas have found that their only adequate supply of irrigation water is brackish. The question has arisen, therefore, as to what extent brackish water can be used, especially for truck crops, without severely injuring the crops or causing damage to the soil.

During the latter part of 1956, a survey was started to determine the extent and nature of the brackish water problem. This survey is being carried out in New Jersey, Virginia, and South Carolina in cooperation with the Soil Conservation Service. At least six wells, well-storage ponds, or seepage ponds were selected as sampling sites in each of these States. Water samples are collected monthly from these sites and analyzed in the Agricultural Research Service laboratory at Norfolk, Va. Soil samples are collected at the same time from areas irrigated by these water sources and are also analyzed. Over a period of a few years, this survey should give much needed information about seasonal fluctuations in the degree of brackishness, the effect of rainfall on salt concentration, and the effect of these waters on soils and crops.

Note:—The authors are soil scientists, soil and water conservation research division, Agricultural Research Service, Norfolk, Va.

There are three general sources of irrigation water for this region: wells, seepage ponds, and rivers and streams. Wells are widely used. In many places, however, the wells are subject to contamination by salt water intrusions or pockets of saline materials in the substrata. The salt water intrusions usually come from an encroachment of sea water into unconfined ground water in coastal areas. Intrusions may also occur in confined aquifers in contact with sea water where the water table has fallen below sea level due to heavy pumping.

Salt water intrusions have occurred in several coastal areas where industrialization has created enormous demands on the local water supply. Increasing demands by municipalities and irrigation farmers have also contributed to the problem. A rapid depletion of fresh water in such areas inevitably creates a danger of salt-water intrusions. Data from the Eastern Shore Peninsula of Virginia on well water analyses indicate that contamination from salt water intrusions have already occurred in a few places.

Farm ponds are becoming an increasing source of water supply for supplemental irrigation. Where these ponds are constructed in coastal areas, they may become contaminated by salt water. In some localities tidal inlets are being used for ponds by placing dams across the inlets and pumping out the salt water. Supposedly, fresh water recharge of such ponds should give water of usable quality. But frequently, sufficient salt remains to contaminate the ponds for a considerable length of time, or the ponds become recontaminated by salt water seepage or tidal inundation.

The proper selection of pond sites is of utmost importance. There must be a sufficiently large watershed to give a fresh water recharge from surface runoff as well as from subterranean seepage. Where dams are constructed in tidal inlets, they must be of sufficient height to

prevent overtopping by tidal waves during storm periods.

One example of overtopping has been observed in the Norfolk area on the Beasley Farm. This particular pond, at the time of first sampling, had a salt content of 240 p.p.m. (parts per million). During a storm in September 1956, tidal waters backed up and went over the dam. After the storm subsided, the pond was sampled and found to have a salt content of 17,880 p.p.m. This could have been avoided if an adequate survey had been made during the planning stage.

Some farms use storage ponds. These are not actually water sources, but reservoirs for storing water to be used when the initial source of water is not adequate for the area to be irrigated. These reservoirs can be used in conjunction with wells, seepage ponds, streams, or drainage ditches. The salinity of the water depends largely on the source of supply.

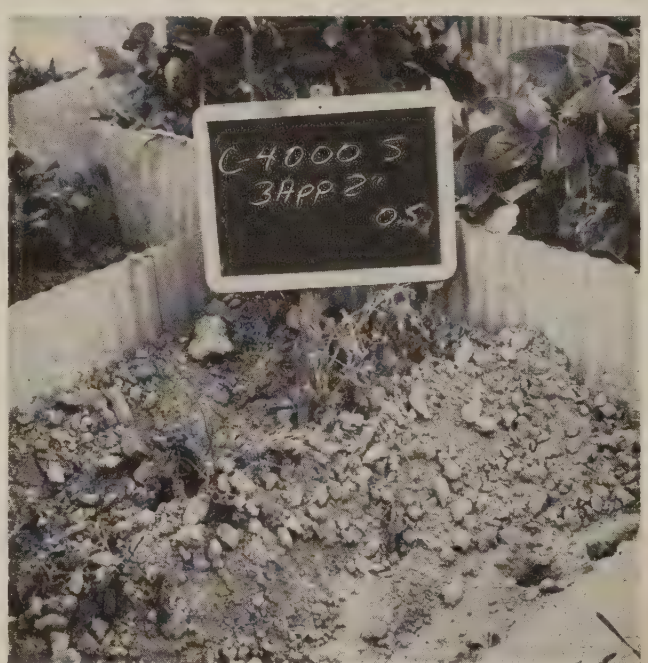
Another source of water is from streams and rivers. Where these streams and rivers are affected by tidal waters, the salinity decreases gradually with increasing distance from the salt water body. The salt content at various locations and the maximum salt concentration tolerable for irrigation at a particular location must be determined.

Chloride content alone does not provide sufficient information on the fitness for irrigation. Electrical conductivity has been found a much better single value criterion for the degree of salinity. In doubtful cases, a complete analysis may be necessary. The proportions of the various ions present is almost as important as the total salt concentration in determining the fitness of water for agricultural use. It is essential, therefore, when using brackish water to have some knowledge of its composition as well as concentration at time of use.

There are many factors to be investigated in providing a suitable source of irrigation water. Where seepage ponds are adjacent to tidal areas, information is needed about the design and location, in order to minimize seepage of water from brackish sources. The importance of proper dam construction to prevent overtopping during storm and high tide periods cannot be overstressed. Where wells are used in areas subject to salt water intrusions, information is needed concerning the rate at which water can be pumped to keep brackishness to a minimum. A study of the hydrology of these areas is necessary. Storage ponds can be used to ensure an adequate supply of water at irrigation time in conjunction with streams contaminated by tidal waters if water is stored when the lowest possible salt concentration is present. It is also possible that a low-cost method for reducing the salt content of brackish waters to a usable agricultural level may one day be devised.

Statistics indicate that over 90 percent of supplemental irrigation in the East is applied by sprinkling. In most cases little damage to foliage results from direct application of brackish irrigation water. There is, however, a danger of severe burning of plants adjacent to areas under irrigation where the salt spray evaporates on the foliage and builds up salt concentrations on the leaf surface many times greater than that of the water applied.

Perhaps the most important soil factor in brackish-water irrigation is drainage. When using saline waters, it is imperative that no areas of high salt concentration be allowed to develop in the soil. There is no problem in soils having excellent internal and surface drainage. Restricted internal drainage, whether due to



Beans, low salt-tolerant plants, were killed by three 2-inch irrigations with brakish water containing 4,000 p.p.m. of salts.

Beans were stunted but survived when irrigated with two 2-inch applications of water containing 4,000 p.p.m. of salts.

the texture of the subsoil, a hardpan, or a zone of compaction, will eventually cause zones of high salt concentration in areas where brackish water is used, since salts are not flushed out of the profile and evaporation causes salt to accumulate at the surface.

In areas of imperfect drainage, therefore, the engineer can do much toward preventing zones of salt accumulation in the soil. Among the remedial measures used are land leveling, surface drains, subsoiling, and tile drainage. Knowledge of the water-transmitting properties of the soil, subsoil characteristics, and water-table information are essential to good planning.

Internal drainage is important for another reason. Farmers depend upon winter rains to leach out salt accumulated during the summer. Good internal drainage will allow salt accumulations to be leached out of the profile.

A research project was established at Norfolk, Va., in the fall of 1955, for the purpose of studying the factors involved in the use of brackish water for supplemental irrigation.

The small amount of experimental data obtained thus far indicate that several factors must be considered:

1. The relative salt tolerance of crops must be taken into consideration.

2. The amount of water applied per irrigation should depend on the nature of the soil, especially with respect to internal drainage.

3. The frequency of irrigation should be governed not only by the moisture content of the soil, but also by the amount of intervening rainfall and its effectiveness in leaching out salt accumulations. Internal soil drainage should also be considered.

4. The concentration and composition of salts in the water will greatly influence the above factors.

5. Climatic conditions affecting evaporation losses during the crop and rainfall distribution throughout the year are important in determining the salt status of the soil.

6. The nature of the soil itself will determine the degree to which salts can be flushed out of the soil and the extent to which exchangeable sodium can unfavorably influence soil structure or affect plant growth.

With respect to making recommendations, it is not possible to set any specific limit on the salt concentration of water as being "safe." It is necessary to take into account all of the above factors in the use of brackish water for irrigation. Since all of these factors are interrelated, all must be taken into consideration. Studies are being undertaken at present to clarify some of the plant-soil relationships involved in the use of saline waters.

FATHER AND SON.—Othniel Wienges recently succeeded his father as a supervisor of the Calhoun County Soil Conservation District in South Carolina. Since his graduation from the University of South Carolina he has farmed with his father on Singleton Plantation. Their farm operation is diversified, including cotton, small grain for seed, tobacco, soybeans, beef cattle, and race horses. Othniel is, in addition to his other activities, president of the Calhoun Farm Bureau.

O. H. Wienges, Sr., has resigned as soil conservation district supervisor after 18 years. He was elected Calhoun County's first member of the board when the district was organized in 1938-39. At that time, he served with farmers from Lexington and Richland Counties in the Congaree Soil Conservation District, which included the three counties.

When the Calhoun district withdrew from the former three-county district to form a separate county district, Mr. Wienges, Sr. was appointed one of its charter supervisors. He served as its vice-chairman. Under his leadership the educational advisory committee purchased and placed conservation literature in the

libraries, furnished teachers associations with speakers, and held farm tours for the teachers. Each year he attempted to get more conservation taught in grammar schools as a part of the regular school program.

"I am still interested in conservation and will do all I can for the betterment of our community, but I feel that it's time for younger men to assume the leadership," Mr. Wienges remarked as he stepped aside for his son, Othniel, to assume the duties. The board presented Mr. Wienges with a bronze plaque for his outstanding service.

—J. B. EARLE

Poor Land—Rich Land

A Poor Sandy-land Farm is Converted to a Productive Farm Through Soil Building Practices.

By W. A. MASON

"IF this land were any poorer it could only be used as a sandpit," said Everette Kneece as we walked over his 138-acre farm 3 miles northeast of Pelion, S. C., a few years ago.

Yet, through a good land use and management program, this sandy-land farm is now paying for itself and showing a profit.

Kneece bought the 138 acres several years ago from John Joyner for $800. Joyner had bought it several years before from Frank Harmon for $600.

"I wouldn't take $5,000 for the place today," said Mr. Kneece. "I paid for it the first year by selling truck crops from 3 acres of the best land."

In the County Farm Bureau Corn Contest in 1954, Kneece averaged 74 bushels on 5 acres. To produce such yields he has to keep adding organic matter to this thirsty-type soil. Soybeans that were planted in 1957, after sericea, yielded about 25 bushels.

On another field, Kneece has planted Bahiagrass in rotation after he had seen the outstanding yields a neighbor got from squash after turning under Bahia for soil improvement.

Luxuriant growth of soybeans on the Everett Kneece farm.

In the spring of 1953, a 14-acre sand field was planted to coastal bermudagrass. Kneece began to let his cows graze this field in 1954 and has done so every year since. Early in 1957, he put 50 loads of chickenhouse litter on this field. He also applied 500 pounds of 3-12-12 fertilizer per acre and later added 300 pounds of 20 percent nitrogen per acre.

He kept 13 cows on this 14-acre field from March through September in 1957. Even while the cows were on the field, he cut 500 bales of hay that averaged 60 pounds each, and he got another cutting of hay before frost.

"I'm not going to destroy any of my pines, but I am going to clear up all of my land in Blackjack oak and plant it to Bahia or coastal bermudagrass," Kneece said.

His plan of operations was worked out with the assistance of SCS technicians servicing the Lexington Soil Conservation District with which he is cooperating.

Note:—The author is management agronomist, Soil Conservation Service, Newberry, S. C.

FARM POPULATION.—Recent estimates of the Bureau of the Census show that the farm population of the United States was only 12 percent of the total population in April 1957. There were 20,396,000 people living on farms, according to the estimate. This contrasts with the more than 25 million farm population in 1950, when farm population was 16.6 percent of the total population of the Nation.

Are We Getting The Job Done?

A District Supervisor Answers His Own Question in This Article by Telling How His District Achieved Success Through Community Effort

By MIKE SMITH

THE Nueces-Frio-Sabinal Soil Conservation District is much like other districts in the United States. All districts have people, land, water, and plants. Take these four things, encourage them to work together, and you have conservation.

Supervisors in all districts must have help to carry out a successful conservation program. If a board of supervisors will enlist the help of all available citizens, groups, and organizations, they cannot fail to fulfill their obligations as governing bodies of soil conservation districts. But, first, the supervisors themselves must have the interest and desire to serve and devote some time to the job.

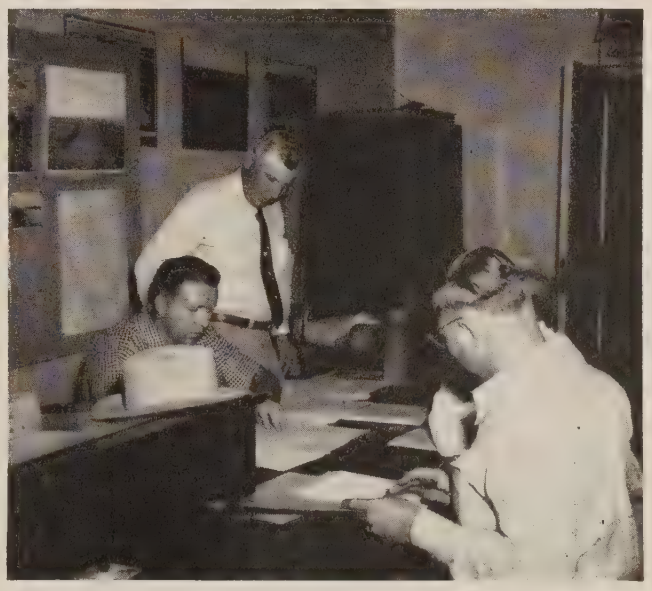
Our district has achieved statewide fame in Texas by winning numerous awards in the past 4 years. We know this came about by the use of the resources we had available in our people. The supervisors, themselves, did not accomplish these feats alone. They received help and lots of it.

How did they get this help? This is how they proceeded: A planned program for each month of the year was made, and the supervisor best qualified to handle the particular program or project was designated to do so. The responsibility of promoting a plan of action rested entirely on that supervisor. This was a "must", since there are so many jobs each supervisor and his district should be doing. But it was up to the other supervisors to help him and back him in his work.

It was found that Boy Scouts, civic clubs, garden clubs, wildlife associations, schools, and practically all other organizations in the district had a committee on Farm and Ranch, Agriculture and Conservation, or whatever they wished to call it. The trouble was that most of the committees did not have any definite projects on which to work. When we discovered that, we gave them suggestions and asked them to help us on our program.

Clergymen, teachers, bankers, and many businessmen were anxious to help when asked, and were a great help. The more people we were able to involve in a project, the more the project was publicized and talked about. Pastors throughout the district took more and more interest in conservation. For the past 4 years, more than 20 churches out of the 25 contacted have observed Soil Stewardship Sunday. We buy booklets and church bulletins for them. This is an important program and districts make a grave mistake when they do not encourage it.

Another step we take in planning the year's work is to discuss the problems and needs of the district with those men who serve districts so well and faithfully—the Soil Conservation Service technicians.



District supervisor, J. V. Porter (standing), and committee work at selecting best essays on conservation.

Note:—The author is a supervisor of the Neuces-Frio-Sabinal Soil Conservation District, Texas. This article is a digest of a speech made by the author at the annual conference of the Association of Texas Soil Conservation Districts, Tyler, Tex., January 1957.

Telling the conservation story is about the most important job of district supervisors. We have a grassplot display at the sales barn with 57 varieties in it. A sign reads, "To understand and know plants is the first step in conservation ranching." Several business houses put up large pictures of local conservation practices at which they point with pride. All these displays are kept current.

One of our activities that we are most proud of is the education program on conservation of soil, water, plants, and wildlife in our four public schools.

Here is how we started it:

In 1953, J. V. Porter and John Monagin, both supervisors, suggested that the district try to get the local schools to teach more about conservation of natural resources. It was found that 90 percent of all students graduating from high school never were taught any conservation except a little in Science classes. It was decided to invite all school superintendents in the district to our July meeting and to present the problem to them.

We called on A. C. Spencer of the State soil conservation board to attend this meeting and help us. All of our school superintendents attended. M. B. Morris, superintendent of Uvalde schools, invited the supervisors to bring a program to the next area teacher's meeting, in October 1954. The board accepted and asked Howard Boswell, our State executive director and editor of *Soil and Water,* to give a program on "Teaching Conservation in the Public Schools" for a group of 130 teachers. John Beard, of the SCS, showed some slides on conservation, and he outlined what the district and SCS could do to help them with this program. It was a success. We gave them a list of agencies, groups, and individuals who would help them with programs and conservation tours.

Did this pay off? Well, last year for instance, 771 students wrote essays on conservation, more than 100 boys entered our annual range and soil judging contests, and all schools put up conservation displays during public school week. The staff of West Main Junior High School of Uvalde now teaches a full semester course on conservation.

Local citizens help judge the school essay

School Superintendent M. B. Morris discussing the importance of conservation with schoolchildren.

contest each year. This is a huge job and a lot of help is needed. We found that local people felt honored when asked to help. All winning essays are published in local papers to give students recognition and to create more interest for the future. The names of the judges are also publicized.

Every year we have a wildlife tour in cooperation with our local wildlife association. The association sends landowners to the district for wildlife conservation plans. The annual tour attracts absentee landowners, district cooperators, sportsmen, and city dwellers.

The wildlife association cooperates in selecting men who do outstanding work on wildlife conservation for awards. Their secretary, Garvis Marsh, assembles the information for award entries. It is quite a job to write up awards, and again, outside help is needed. Several people in the district help in this undertaking and are always thanked for a job well done.

Press and radio give recognition to those who cooperate with our projects and programs. This gives encouraging results, because people are pleased to hear their names over the radio and to read about themselves or are interested in the activities of a neighbor or friend. When a certain project is completed, praise and thanks always are given to those persons who cooperated to make a success of the undertaking.

A shining example of local help to our district developed after the district learned the possibility of getting a grant of seed-cleaning

equipment from the Soil Conservation Service. All local groups were mustered to develop a plan of action for getting and using this equipment. We presented a plan on how we intended to operate it. People donated trucks and labor to tear it down in San Antonio and set it up in Uvalde. The city of Uvalde gave us a building to use. Dave Foster, a local cooperator and seed grower, gave days of free time to supervise the entire project.

In 1956, the value of K R bluestem, blue panic and buffelgrass, cleaned in the plant was $276,541.80. Some 122,600 pounds of buffelgrass, 31,215 of blue panic, and 26,923 of K R bluestem were cleaned. This doesn't take into consideration other grasses and small grain. The district's payroll is close to $8,000 a year. We are not trying to make a lot of money. Our main goal is to be of service to landowners and break even. So far, so good.

During the past 4 years our district has won its share of awards. We have won two State awards in the Frank M. Woods Wildlife Awards program, and one year were selected regional winner. In the National Goodyear Conservation Awards program we won second place in 1955 and first place in 1956 as the "Outstanding District" of Texas. We were State Champion in the *Fort Worth Press* Awards program on wildlife in 1956. We had the regional "Outstanding Farmer" in 1956. Our businessmen have been selected in the region as individuals rendering the most unselfish service to districts for 3 years straight. These men were: Eric Beecroft, Dave Foster, and Roy Kothmann. One of our local students had the champion essay one year with several placings in other years. At the 1957 State convention we were given a beautiful plaque as State Champion in the National Farm Life Insurance Company Awards program for "The Most Effective Use of All Groups." We used the $200 cash award to purchase a camera. In 4 years, we've won 22 State and regional awards.

FFA and 4-H Club boys participate in range judging contest.

Bankers attend tour on conservation irrigation.

We have a District office that is all our own. The district having its own office helps distinguish the difference between SCDs, SCS, and other agencies and groups.

I close by saying to all fellow district supervisors: If you are not willing to serve, then get off the board, because you're dead weight. Be interested, be active, and never fail to put in a good word for districts. You must make a few calls on people if you want results. Your district will only be as good as you make it. If districts fail, if people reject the conservation responsibility, which they must accept in a democracy, then I ask you, what comes next? We know the answer to that. The Government might have to take over and force the "must conservation" on us. We don't want this to happen.

The Nueces-Frio-Sabinal Soil Conservation District will continue its attitude and its plan of action. We hope to encourage more conservation and accomplish even more in the future. With the help we so generously received in the past, we will be able to achieve our goal. We've had a 7-year drouth down here, too, but we didn't use that as an alibi for stopping our conservation efforts.

Ponds for Irrigation

Small Range Cattlemen in Utah Find It Difficult to Subsist Without Ponds for Summer Irrigation of Hayfields.

By C. W. ZUMWALT

THE southwestern corner of Utah has a low-elevaton area commonly known as Utah's "Dixie," a hot desert country. Temperatures of 115° in the summer are not uncommon, and there are long periods of 105° to 110°.

Wherever a small stream of water can be found in this desert it is a foregone conclusion that a lot of the water has been lost along the course through seepage. What is left, the sun seeks out, and evaporates with merciless dispatch. If by chance there is a stream of water left after a few hours in the sun and sand, it is rarely large enough to irrigate with.

Several long canyons run through the Lower Virgin-Santa Clara Soil Conservation District. These canyons drain the watersheds of a range of mountains that form a rim along the northern edge of the district ranging from 7,000 to 10,000 feet in height.

Small, clear streams start down these canyons and are often supplemented by springs along the way. In early spring there is usually enough snowmelt to furnish quite a lot of irrigation water; enough, in fact, to irrigate all of the farms in each canyon at least once. Spring usually ends in April; and May begins the long, hot, dry summer.

As the heat of summer begins to bear down, the business of irrigating becomes a mute battle between man and the burning sun over a trickle of water. More often than not, the sun wins the battle. By September, what is left of a small hayfield is hardly worth mentioning. At least this was the story a few years ago.

Note:—The author is work unit conservationist, Soil Conservation Service, St. George, Utah.

Two of the ponds and alfalfa fields irrigated from them on the Henry Bowler ranch.

Ranchers settled these canyons in the early days of Utah's history—1860-70. Ranching in those days amounted mostly to keeping the cattle branded and scattered to the best feeding areas. Irrigation farming was done only on home gardens, fruit trees, and small hayfields used for wintering weak cows.

The few level spots along the canyon bottoms were hunted out and used for these small hayfields. Irrigation water was diverted out of the canyon bottom by means of temporary rock and dirt dams into ditches that snaked their way around cliffsides and through talus slopes onto the small fields.

In many respects, modern day ranching is not as easy as it was a few decades ago; competition is much keener. Factors, such as overgrazing, market demands for better beef, and an economy demanding a better calf crop and a healthier herd have all helped make it difficult for the small cattleman. He is just about forced to raise more and better pasture and hay to supplement scanty range feed to put his business on a dependable footing.

Recent drought years in southern Utah have made the situation critical. All stockmen feel more secure if they can go into the dry winter months with a good supply of alfalfa hay in the stackyard. The winters aren't cold, but there is just not much feed on the desert ranges.

Some ranchers in the desert canyons have been in favorable places along the streams. In good years they were able to divert large enough streams to irrigate two or three small fields of hay. They would get one or two fairly good cuttings of alfalfa during a year of good water supply. Even then it was difficult to get a large enough stream to do a good job of irrigating.

Let us take the story of Henry Bowler of Gunlock, Utah. Henry and his two brothers, Dick and Lewis, run a ranch in McGotsue Canyon near Gunlock. Each of the brothers has what he calls "his own" portion of the ranch, but the place is really a teamwork outfit. Throughout the ranch's length of several miles of canyon country, are about 9 or 10 spots level enough to farm and irrigate. Each of these spots is 2 to 8 acres in size.

McGotsue Creek, in the spring, starts flowing with a flourish and gives the impression of a

Henry Bowler opens the valve on one of his ponds while SCS engineer looks on.

continuously ample water supply. Each of the fields get a good irrigation, then summer comes and the creek dwindles to a trickle.

The only way the Bowlers could manage an irrigation was to stay right at the bank of the stream and gingerly transfer its water by hand from row to row onto the best fields. The other fields, for the most part, would just dry up.

On one such perennially "dried up" field Henry usually gambled on getting a good water year and tried some kind of a crop. Once in awhile, when the snow pack was deep in the mountains, he would get a good crop of barley on this 2½-acre field. Usually, though, he planted a few rows of melons and nursed a small stream of water through them the whole summer. With about 4 rows of melons Henry could sell a few and have melons for his family and neighbors. Sometimes he would sell from $50 to $100 worth of melons to the stores in St. George, some 20 miles away.

In 1951, Henry was elected as a supervisor for the Lower Virgin-Santa Clara Soil Conservation District. In the process of developing a conservation plan on his place he hoped to find

A fresh cutting of alfalfa on one of Bowler's irrigated fields.

a site for a small farm pond. He believed that by running the small McGotsue Creek into a pond for a few days he could store enough water to furnish a good irrigating stream.

A pond site was hard to find on the rocky canyon sides, but by tramping over the hills together, Henry and the SCS engineer were able to locate a suitable pond site.

Late in 1953, he built a pond for this 2½-acre field where he could usually depend on getting a few rows of melons. He sowed the field to barley and alfalfa early in 1954. In 1955, he harvested 455 bales of alfalfa, averaging 60 pounds each from the 2½ acres. In other words, he realized 13½ tons of baled hay from this field. In 1955, that much hay was worth $340. In addition to the baled hay, Henry had several weeks of good fall pasture on the same field. The pasture alone was worth more than any of the previous melon crops. The 1957 hay crop was even better.

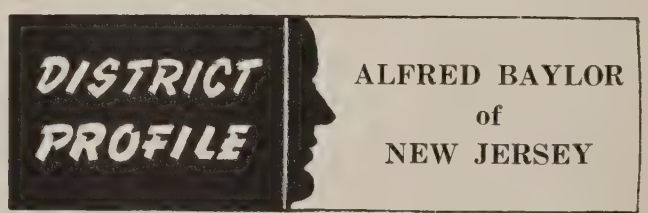
The pond was built in cooperation with the Agricultural Conservation Program for a total cost of $552. The ACP payment was $286; thus, Henry's total cash outlay was only $266.

Henry is so enthusiastic about using farm ponds to accumulate water that he now has three ponds for as many fields. He and his brothers together have seven ponds for nine fields.

Some people might question the economics of having a pond for each small 2- to 8-acre field, but Henry Bowler understands this kind of economics better than most. He is still in business and frankly admits that he would be in pretty bad shape if it were not for those ponds. If you ever want to see a proud irrigator, go with Henry when he opens the valve on one of his ponds.

Many other ranchers in a similar situation have adopted this idea of water conservation. The Lower Virgin-Santa Clara Soil Conservation District now boasts 119 farm ponds constructed with district technical assistance and ACP financial help. Of these 119 ponds, 75 were built for the same type of situation as the 7 ponds on the Bowler ranches.

Conservation has many ways of making life better on the desert; a farm pond formed from a tiny desert stream is one of the best ways. Land leveling, improved ditch work, and concrete ditch lining are also good desert farm practices, but in this canyon country the pond has to come first.



IF you are driving through northern New Jersey and a cloud of dust streaks by, don't be alarmed: It's probably only Alfred F. Baylor on his way to keep one of his many appointments.

Baylor runs a 297 acre dairy and poultry farm a mile north of Delaware, N. J. He keeps 100 Holstein cows and 4,500 white Leghorn laying hens. That should be enough to keep the man busy; but, Baylor finds time for a lot of other things, especially soil and water conservation.

Alfred Baylor first became interested in soil conservation in 1951, when he built 1,800 feet of diversion terrace; his first conservation practice. Since then he has continued to carry out a

complete and dovetailing conservation program. In the past 6 years he has added nearly 1,900 feet of diversion terraces. He has changed from old-fashioned straight-row farming and put contour strips on 120 acres. To make the change he had to remove 8,000 feet of stone fence and hedgerows. The farm had been split into fields too small for contour stripcropping.

Rotating soil-improving, with soil-depleting crops is another conservation measure Baylor has installed. That way he keeps his soil in good condition. It's easier to work and produces more. With an eye to the future, he has planted an acre of locust trees to furnish fence posts.

To avoid wet spots, Baylor has put in almost 2,800 feet of tile drains. With his own bulldozer, he has built a 1-acre farm pond and stocked it with bass and bluegills. The pond provides food, fire protection, and recreation.

Baylor was appointed a supervisor of the Warren County Soil Conservation District in 1952. In 1953, his fellow supervisors elected him chairman, a post he has held since then.

The Pequest watershed was set up as a pilot watershed protection project in 1953. Baylor was elected chairman of the Pequest Watershed Association, an office he still holds. The Warren and Sussex County Soil Conservation Districts sponsored the project jointly. When the local people organized the Paulinskill watershed project in 1956, Baylor was elected chairman by the sponsoring agencies.

Baylor worked long and hard to get the easements needed before the Pequest watershed work could start. He organized Soil Stewardship Sunday services in Warren County. The Warren County Soil Conservation District won the Goodyear Conservation Contest in 1953-54. Baylor accompanied the district's outstanding farmer, Norman Schnetzer, on a 10-day trip to the Goodyear conservation farms at Litchfield Park, Ariz. At the farms, Baylor took movies of the conservation practices. He has since shown the film all over New Jersey, letting city and rural people alike see what conservation farming looks like and what it means in soil protection and higher production. He also gives talks on conservation before local Granges and service clubs.

Alfred F. Baylor

Just a listing of Baylor's organizations shows what a busy fellow he is. He is vice president of the New Jersey Association of Soil Conservation Districts, master of Pomona Grange, treasurer and past master of Moravian Grange, past president of the Warren County Board of Agriculture, president of the Warren County Fair Association, treasurer of the Knowlton Township Board of Trade, former mayor of Knowlton Township, chairman of the Producers Association of Welshes Creamery, and president of the Board of Trustees of Hope Methodist Church.

He is also a member of the local Selective Service Board, State and County Poultry Growers Association, Belvidere Rotary Club, Masonic Lodge in Belvidere, Shrine of Valley of Trenton, West Jersey Shrine Club, and the Tall Cedars of Phillipsburg.

—Don Wolff

Progress in 1957

By D. A. WILLIAMS

As the soil and water conservation program continued to expand in 1957, the scope and versatility of the Soil Conservation Service's responsibilities and activities increased. The Service had whole or partial responsibility for administering or providing technical assistance on 15 programs of the Department.

The activities and programs included: Planning and technical assistance to 2,751 soil conservation districts; the national soil survey, works of improvement on 11 watersheds authorized for flood prevention; demonstration of the value of watershed treatment measures on 55 pilot projects; cooperation with local organizations in watershed protection projects as authorized under Public Law 566, as amended; completion of water conservation and utilization projects under the Case-Wheeler Act; leadership in the long-range Great Plains Conservation Program; making cooperative snow surveys and runoff predictions for 11 Western States; leadership in the Department's conservation needs inventory; technical assistance on interagency river basin investigations; providing statistical and technical data to State legislative and executive agencies on conservation problems; technical aid on soil- and water-conservation problems to the Agricultural Conservation Program, Soil Bank, Rural Development, and Conservation Loans programs.

In addition to the expanding scope of conservation activities, several significant and encouraging trends were noted for the year. One was the display of greater interest and assumption of leadership on the part of State and local agencies.

Many States provided increasing amounts of funds for clerical and other aid to soil conservation districts. Some States furnished watershed planning parties to supplement existing SCS planning services on watersheds eligible for Federal assistance under P. L. 566. Several States requested and received historical, factual, and technical information from SCS specialists on problems for which new legislation seemed to be needed, especially on water rights and related water resources problems.

County and township governments also increased their participation in the conservation program. These local governing bodies gave both financial and physical support to the conservation movement in many ways. Heavy equipment, used primarily for road building and maintenance, was made available for earth moving conservation jobs in many localities. Financial support from these local tax raising authorities was given to an increasing number of soil conservation districts, watershed associations, and other conservation organizations. Municipal and other local government agencies also contributed more, both in financial and physical assets, toward advancing the conservation movement than ever before.

A definite trend was noted toward increased participation in the conservation movement by privately owned corporations and companies and by non-land owning individuals and groups. Industrial companies that get most of their raw materials from the land, are giving more and more support to the type of conservation that can assure them of a continuity of supply. There has been a great increase in the number of private contractors, especially those with earth moving equipment, who devote a large part or all of their time to conservation work. Farm equipment manufacturers and dealers are devoting more and more attention to conservation work and better types of equipment for doing it.

The most pronounced development in local leadership, however, has been the increased activity of soil conservation districts, watershed associations, and other local organizations concerned mainly or wholly with soil- and water-conservation work. Such local organizations are assuming leadership and taking responsibility for any or all conservation activities in many

Note:—This article is a digest of a report submitted to the Secretary of Agriculture by the Administrator of the Soil Conservation Service for the fiscal year 1957.

areas. This is a healthy situation. It gives a truly locally-sponsored and locally-directed conservation program in those areas.

Where urban or municipal interests have teamed up with agricultural interests in a community the conservation program has advanced much more rapidly. In some cases the urban leaders and people have been drawn into the conservation movement because of critical problems that directly affect them, such as floods or threats to municipal or industrial water supplies. In many cases, however, civic clubs, industrial groups, and others have adopted conservation as a major objective in their programs simply because they wish their community, State, and Nation to remain strong and progressive.

Regardless of the motivating factors, the conservation movement must have this urban support if it is to succeed, because about 88 percent of our citizens are urbanites. The 12 percent that are engaged directly in agriculture cannot bear the full load of conserving the Nation's basic resources. They must have moral support, and often physical and financial support, from the other 88 percent of our population. Fortunately, farmers and ranchers are getting such support to a greater and greater extent.

Another development that appears significant is the expanding use made of soil surveys. Urban and suburban developers, highway engineers, tax assessors, health departments, industrial developers, and other groups are recognizing that the present type of soil surveys furnish basic information which helps plan and execute programs involving land.

Soil Conservation Districts

Farmers and ranchers organized 62 soil conservation districts during the year. This brought the total number of soil conservation districts (including 10 grass conservation districts and the Imperial California Irrigation District) to 2,770 in the United States, its territories and possessions. At the end of the fiscal year the Department and the SCS were assisting 2,751 districts, 51 more than a year earlier.

Approximately 93 percent of all farms and ranches and 88 percent of all agricultural land in the Nation are now in locally administered conservation districts.

During the year, 122,492 farmers and ranchers operating about 38 million acres became cooperators with their local districts. At the end of the year 1,727,682 active district cooperators were operating about 515 million acres.

Soil Surveys

Soil surveys suitable for farm planning were completed on about 34.8 million acres during the year. (About 20.1 million acres were standard soil surveys, while 14.7 million acres were soil conservation surveys.) Range surveys suitable for ranch planning were completed on about 13 million acres. Soil surveys were about 10 percent greater and range site surveys 16 percent greater than the preceding year.

The main emphasis was on increasing the acreage of standard soil surveys (surveys in which the soil mapping units fit into the national classification scheme). The acreage of standard surveys has quadrupled during the past 3 years. In the meantime, the acreage of soil conservation surveys, (made mainly to furnish the information needed for immediate use in farm planning) declined. Considerable progress was made in the conversion of soil conservation surveys and other types of surveys to standard soil surveys during the year.

A program of mapping and measuring sample areas was started to provide information needed for the national inventory of conservation needs in counties where detailed soil survey information is not available. Additional soil scientists were transferred or detailed to the Great Plains to help expedite the soil survey program in critical areas of that region. The cooperative program with the Bureau of Public Roads for obtaining and interpreting data on the engineering aspects of soils was continued.

Work is continuing on capability and other interpretive soil groupings and on estimates of crop yields under various levels of management. Field studies to establish capability class benchmarks for key soils were carried on during the year.

Nine soil survey reports with maps were published during the year. At the end of the year, 47 soil survey reports were in the Government Printing Office awaiting publication. In addition, 33 reports were in the process of editing and map compilation.

Efforts to revise the nationwide system of soil classification were continued. A fifth approximation was completed and distributed to soil scientists during the year. The final classification should be completed within the next 2 years. Progress was made on the basic World soil map, though this project is far from completion.

Farm and Ranch Planning

The Service assisted more than 1 million farmers and ranchers in developing conservation plans, revising existing plans, or in applying parts of their conservation plans during the year. Basic conservation plans were completed on 92,660 farms and ranches, covering more than 27 million acres. Basic plans were revised on an additional 11,065 farms and ranches, covering nearly 5 million acres. Through progressive planning procedures many thousands of other farm and ranch plans were advanced from an initial to an advanced stage.

At the end of the year more than 1.7 million soil conservation district cooperators, controlling more than 515 million acres of land, were using conservation plans that SCS technicians had helped them develop. Of these,

1,161,745, with about 326 million acres, had basic conservation plans on their farms and ranches.

Group Planning

Service personnel provided technical assistance to soil conservation districts, in laying out 2,398 group drainage jobs affecting nearly 3 million acres and 1,079 group-irrigation projects affecting more than 2 million acres. These figures do not include watershed activities on established watershed projects.

Watershed Planning

The development of work plans for entire watersheds received continued emphasis. At the end of the year watershed planning parties, usually consisting of 4 or 5 professional employees, had been authorized for 42 States with smaller parties in other States and territories as needed. The recruitment and training of technicians and aides for watershed planning continued.

Applications for assistance on watershed protection work, under P. L. 566 were received from 165 small watersheds during the year. This brought the total number of applications received for watershed planning assistance to 712 from 46 States and Hawaii. During the year, 96 applications were approved for work plan development, bringing the total watersheds approved for planning to 268 in 45 States. Twenty-nine projects were approved for operations, making a total of 42 in the operations stage. At the end of the year 27 tentative and 22 final work plans were being reviewed for operations.

Work plans were developed for 21 subwatersheds in the 11 watersheds authorized in 1944, for flood prevention work. This brought the total of subwatershed work plans completed on these projects to 150.

Modified program reports were completed for the Little Sioux and Coosa watersheds. This completed the modified surveys and reports authorized for 9 of the watersheds in this program. From these reports, it was determined that the estimated Federal and non-Federal costs of the flood prevention program are 43 percent and 57 percent respectively.

At the close of the year, 55 pilot watershed projects were active or completed. Operations on 3 projects were terminated during the year at the request of the sponsors. At the end of the year 1 project was fully completed, 19 were more than 90 percent completed, and 25 were from 50 to 90 percent completed.

River Basin Planning

With the assistance of other agencies, comments were developed for the Department of Agriculture on 22 proposed reports of the Corps of Engineers, on 8 proposed reports of the Bureau of Reclamation, and on 1 report of the Public Health Service.

Service personnel represented the Department on the Arkansas-White-Red Rivers, Columbia River, Missouri River, and Pacific-Southwest Interagency Committees, and on the Northeastern Resources Committee concerned with river basin planning.

Land Treatment

The major objective of the Service, as it has always been, is to help farmers and ranchers treat their land in such a way as to assure a maximum of soil and water conservation while increasing efficiency of agricultural production. Soil and range surveys, conservation plans, and technical aid in establishing conservation practices on farms, ranches, and entire watersheds are among the main tools the Service has used.

Progress in land treatment is not necessarily measured by the extent to which individual conservation practices are used. A true conservation program must be based on the use of all land within its capabilities and treatment of each tract according to its needs for protection and improvement. Nevertheless, conservation farming or ranching is done mainly by land use adjustments and by applying individual conservation practices and combinations of practices according to the need. Hence, progress may be determined, to a great extent, by measuring the amounts of certain important conservation practices that have been applied to the land.

The following table summarizes the application of some of the most commonly used conservation practices for the Nation as a whole.

Conservation practices newly applied in soil conservation districts, with SCS assistance, 1957.

Contour farming	acres	2,660,044
Cover cropping	"	4,110,385
Stripcropping	"	896,016
Seeding range and pasture	"	3,431,427
Tree planting	"	472,435
Drainage	"	1,301,445
Irrigation land leveling	"	581,245
Improved water application	"	1,410,890
Terracing	miles	50,937
Farm and ranch ponds	number	81,178

When heavy spring rains of 1957 broke a 5- to 7-year drought in central and western Texas, tests showed that conservation farming and ranching helped balance wet spells against droughts. SCS technicians in 120 work units of Texas dug holes or made borings to see how deep moisture had penetrated into the drought parched soil. These field checks included 133 paired observations comparing protected and unprotected land under otherwise similar conditions.

These tests consistently showed that moisture penetrated about twice as deep in fields and pastures that had proper conservation treatment as it did in areas without conservation treatment.

For example, on 40 cropland fields with conservation treatment, moisture had penertated the soil to an average depth of 59 inches. On 40 similar fields without conservation treatment, the moisture had penetrated only 36 inches. On 93 pastures and ranges with good cover or conservation treatment, the moisture pene-

trated to an average depth of 37 inches, while on 93 similar pastures and ranges with poor cover and no treatment the average depth of moisture penetration was only 13 inches.

Flood Prevention

Progress in installing structural works of improvement on the 11 watersheds authorized for flood prevention in 1944 was excellent. During the year, 150 floodwater-retarding structures were designed and contracted for, while 73 such structures were completed. This makes a total of 455 of these flood-detention structures that have been installed to date with a floodwater capacity of 268,020 acre feet.

Altogether, 1,319 stabilizing- and sediment-control structures were completed this year, bringing the total of such structures now installed on the 11 watersheds to 6,506. Channel stabilization and improvement was completed on 141 miles, a total of 1,111 miles. Levees and dikes were completed on 1.2 miles this year, bringing the total to 30 miles that required 437,679 cubic yards of earth fill. Roadside erosion control work was done on 467 miles and 37,515 acres of critically eroding land were revegetated with grass, legumes, or woody plants on the 11 authorized watersheds.

Structural work was accelerated on the 55 active pilot watershed projects. During the year, 68 floodwater-retarding structures were completed, making a total of 206 such structures with 107,328 acre-feet storage capacity. Altogether, 91 stabilizing, and sediment-control structures and 41 silt and debris basins were completed. This makes totals of 1,547 sediment-control structures and 189 debris basins now installed in these watersheds. Stream channel stabilization or improvement was done on 54 miles making a total of 157 miles now completed. Roadside erosion control work was done on 34 miles and 4,014 critically eroding acres were revegetated.

Structural work was started on watershed projects authorized under P. L. 566. During the year, 46 floodwater-detention dams were designed and contracts were let for construction of 21. At the end of the year 8 floodwater-retarding dams, with a capacity of 800 acre feet had been completed. In addition, 6 miles of channel improvement work were completed. Operations on these projects should accelerate rapidly during the next few years, since planning work is now well advanced.

Torrential rains in central Texas and Oklahoma, in the spring of 1957, proved the value of the flood prevention and watershed protection work. Treated watersheds had little flood damage, while similar streams nearby, without watershed protection work, had devastating floods.

For example, 138 upstream dams combined with land treatment measures in the Upper Trinity watershed of Texas prevented estimated damages of more than $1 million to crops, pastures, livestock, homes, buildings, roads, bridges, and utilities during the floods of May 1957. The savings were mainly on valley bottoms in tributary watersheds of the Trinity. The dams, which supplemented soil- and water-conservation practices on the land, temporarily held about 122,000 acre feet of floodwater and trapped 3,000 acre feet of sediment that otherwise would have moved downstream to heighten flood crests and clog downstream channels and reservoirs.

Agricultural Conservation Program

Technicians of the Soil Conservation Service continued to assist Agricultural Conservation Program participants with permanent-type practices on which cost sharing was requested. Certifications for need or practicability, assistance with site selection and layout, supervision of installation, and certification of compliance with specifications were provided on 400,682 farms and ranches whose operators were participating in this program. Such assistance was given on the permanent-type practices which will provide enduring conservation benefits to the land as specified in the national ACP bulletin.

Great Plains Conservation Program

The program development phase of the long-term conservation program for the Great Plains, as authorized by Public Law 1021, was completed during the past year. The Soil Conservation Service has been designated as the Department agency to take the lead in administering this program.

This program will further help farmers and ranchers of the region develop long-time plans for their land including soil- and water-conservation measures and the land use adjustments needed to achieve a more stable agriculture. It provides technical aid and cost sharing assistance over a contracted period of years to farmers and ranchers in designated counties in applying measures as part of an approved plan. The program is scheduled to go into operation during fiscal year 1958.

Snow Surveys

In cooperation with other Federal, State, and local agencies, and private enterprises, SCS obtained accurate snow pack information on about 1,240 snow courses in the Western States during the winter and early spring of 1957. In addition, information obtained from British Columbia on the snow pack of the upper Columbia River watershed was made available to farmers and other interested people as a part of the spring runoff prediction. The availability of runoff information early in the spring and estimates of the amount of water that would be available for irrigation not only helped irrigation farmers plan their cropping systems, but also informed all citizens of the area regarding the possibility of floods and the probable water supplies during 1957.

Soil Bank

The Service provided technical assistance to 15,330 Soil Bank participants during the year. This help included general counseling with farmers and ranchers about the Acreage Reserve and Conservation Reserve phases of the program. SCS technicians gave direct assistance to participating farmers and ranchers in

selecting lands to be placed under contract and installing treatments for longtime protection.

Conservation Needs Inventory

Agreement was reached during the year by the Department interagency committee on policy and procedures for making the national inventory of soil- and water-conservation needs. Field work should start early in the coming year. The goal for completion of the inventory is set as 1960.

The inventory will encompass two main phases: (1) an inventory of land use, conservation problems, and acreage needing treatment, and (2) an inventory of watershed project needs as authorized by P. L. 566.

Conservation Loans

The Service continued to advise the Farmers Home Administration on the feasibility of conservation loans and gave technical assistance on soil- and water-conservation practices for which such loans were made. During the year, such aid was given on about 1,600 farm and ranch loans made by FHA that totaled about $9.5 million.

Rural Development

Technical aid on soil- and water-conservation measures was given to 3,312 participants in the Rural Development Program that is being carried out by the Department to help low income farmers and ranchers in designated counties.

Water Conservation and Utilization

Only one water conservation project, authorized under the Case-Wheeler Act of 1940, was in operation. That was the Eden Valley project in Wyoming. Land development is continuing on the revised schedule adopted in 1956. Progress for the year was satisfactory. It is expected that this project will be completed and closed by 1962.

A DRAIN FILTER GUIDE THAT WORKS

By F. A. MARK, OLIVER D. JEFFORDS, and CARL W. WALKER

A TILE drainage filter usually is a layer of pervious material placed around the tile to facilitate ground water entry into the tile and prevent both erosion of the soil and subsequent damage to the drainage system.

There are two main requirements for a good filter: First, it should be more pervious than the base soil it is protecting in order that there will be no hydraulic pressure built up, and second, the voids between the filter particles should be small enough to prevent particles of the base material being washed into or through the filter. Clogging of the filter or excessive settlement of the tile line due to erosion may occur if the filter is not properly designed.

Meeting the above requirements, in many situations, may become a time-consuming task. Fortunately, the groundwork has been done for arriving at answers to the essential criteria. In 1940, G. E. Bertram of Harvard University published a report of an experimental study of filter requirements setting forth fundamental relationships. This was followed by studies of the Corps of Army Engineers at the Vicksburg Waterways Experiment Station. Still further research was done by the Bureau of Reclamation and the Agricultural Research Service. Definite standards have been set up in size relationship for stability.

The remaining problem was how to get this scientific approach to drain filters in a working form so that the latest and best could be incorporated in tile drainage practice. In working in the irrigated area of the Yakima Valley with its many drainage problems, engineers recognized the need for using laboratory mechanical analysis of soils and filters in the design of drainage systems.

A program was started for gathering soil samples by series and local filter materials for analysis. We used the SCS laboratory at Portland, Ore., for making mechanical analysis of the soil samples. Sieve tests for filter materials were done at SCS area headquarters, Yakima, Wash.

As results were charted, it was concluded that the analytical findings should be cataloged and made available to field engineers, so that as drainage work was done on similar soils it would be unnecessary to wait for tests. Standard forms for mechanical analysis of soils were

Note:—The authors are respectively, deputy State conservationist, Spokane, Wash., work unit engineer, Sunnyside, Wash., and area engineer, Yakima, Wash., all of the Soil Conservation Service.

Typical Yakima area soils and selected local filter materials.

drawn and printed. Similar forms on the same scale were made for local filter materials, but printed on acetate overlays. This provided an opportunity to use an overlay system so that any soil could be combined with any filter material. All forms were placed in a looseleaf folder so that additions could be made as more tests and coverage were given the area.

A sidelight to the system was devised for the use of bottled samples of both the soils and filter materials. These give a more graphic comparison than the curves drawn on the analysis sheets and serve better in working with farmers and contractors, since the bottled samples can be used in the field or pit to make a visual comparison.

With the charts and samples, SCS engineers went to the field to test the field application of their studies. Here they received a surprise. As they showed the results of their tests to contractors and farmers, they found them more than anxious to use the system. The results to date on the use of this proper filter material have been most satisfactory and gratifying. In the past season alone several miles of tile were laid using tested filter materials.

The acid test of the results will be measured over a long period as we are able to encourage more efficient and enduring drainage facilities. Research indicates we are on the right track.

The initial publication of this material, *Handbook and Guide for Drainage Tile Filters,* by Oliver D. Jeffords, is now in the field. This is a part of the drainage guide for Benton, Kittitas, Klickitat, and Yakima Counties, Wash.

In *Highway* magazine for July 1957, an article entitled "Clogging Hazards in Subdrains," by J. M. Robertson, states: "While it is theoretically advisable to test the soils and specify filters for particular soils encountered along the proposed drain, it is to a certain extent impractical and will not usually be done. Therefore, if possible, it is more practical to select a filter gradation which will perform satisfactorily for all soils or nearly all soils. If necessary, the specification can be varied for certain districts or even for certain types of soils." Mr. Robertson has recently requested and received a copy of our guide. We hope it will aid in solving the problem he outlines.

With the widespread adoption of drainage filter guides in soil conservation districts across

the country, the Soil Conservation Service has a real opportunity and a challenge to be of service to the construction industry, highway departments, and others who are faced with drainage problems. As the Service is charged with the responsibility of surveying and coordinating soils throughout the United States, it is only natural that it should take the lead in getting information on drain filters and related soil series. We feel we have made a good start.

Stable Land For Research

A Complete Soil and Water Conservation Program is Installed on a Mountainous Experiment Station.

By ROY R. BECK

CONTRASTING land conditions make the North Carolina Mountain Research Station, just east of Waynesville, an interesting and extremely useful farm. Varied conditions of mountainous slopes, rolling hills, and level bottom lands require many different conservation measures to control erosion and keep the land productive. Here, research workers are gleaning information on better ways and means of farming in western North Carolina.

This research station is owned and operated by the North Carolina Department of Agriculture for the use of cooperating research agencies. Field studies of agricultural problems encountered in the foothills and mountains of the State are carried out by the State Experiment Station, USDA Agricultural Research Service, and TVA. Experiments last from 30 days to many years.

When the farm was purchased in 1944, it consisted of several typical rundown mountain farms having steep, cutover woodlands, eroded hillsides, and wet bottom lands along Raccoon Creek, an unruly stream that flows through the middle of the farm.

Getting the farm into productiveness to support a dairy herd was the first order of business. Barns, silos, and tobacco-curing barns, for research on Burley tobacco production, were constructed. All fences were rebuilt and existing pastures renovated by using plenty of lime and fertilizer before reseeding to more productive legumes and grasses.

M. R. Whisenhunt inspecting Raccoon Creek after channel improvement and stabilization.

By October 1950, when M. R. Whisenhunt was appointed superintendent, the farm was a going concern with work on tobacco, alfalfa, and a small grain test-plot underway, and an ever-growing dairy herd to be fed from the land.

Whisenhunt soon began adding erosion-control measures. He continued planting white pine seedlings on land too steep for pasture and fenced the woods to prevent grazing. Alfalfa for hay and later for silage was seeded on the lesser slopes over which tractor-drawn equipment could be operated efficiently.

Roadbank stabilized with vegetation on the N. C. Mountain Research Station.

Note:—The author is work unit conservationist, Soil Conservation Service, Waynesville, N. C.

Stripcropping on the N. C. Mountain Research Station.

As the steep land was planted back to trees, more moderate wooded slopes were cleared for additional pastures and the new experimental orchard. Limited funds were a constant problem, but by careful planning the conservation work was carried forward step by step. The need for roughage production forced station personnel to crop bottom land fields along Raccoon Creek. This proved to be unsatisfactory, because the crooked, silted-in stream flooded the fields after every hard rain.

Damage to crops was so great that the station called on the Haywood County Soil Conservation District supervisors for technical help in controlling this stream. Soil Conservation Service technicians assigned to the district not only designed and supervised excavation of a straight, enlarged channel, but helped develop a complete conservation program for the entire farm.

Strange as it may seem, it was on this same Raccoon Creek that Harley Ferguson, as a boy, experimented with jetties and levees; structures he used in later years to tame the Mississippi River when he was Brigadier General with the Army Corps of Engineers.

The conservation program at the North Carolina Mountain Research Station has moved along rapidly the last 2 years. An elaborate terra cotta, tile drainage system has been installed in one 12 acre bottom land field, where corn and other row crops can now be grown, safe from flooding.

Contour stripcropping, laid out in even-width rows that are easily farmed with tractors, protect the largest hillside crop field. On this same field, where rainwater gathers in natural drain-

White pine planting on sloping hillside of mountain research station.

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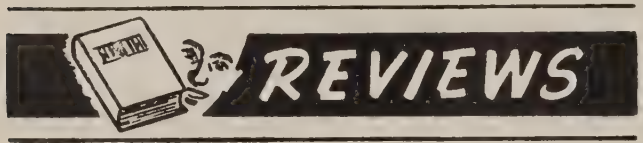
age courses, fescue grass waterways are being seeded to carry surplus water safely down the slope.

Pine and hardwood trees growing on the steepest land are getting their share of conservation treatment. Protected from fire and grazing, these woodlands are to be managed for sawlog production.

From steep mountainous slopes to level bottom land fields, wise land use, along with a wide variety of conservation measures, protect the land and help scientists find better farming methods for western North Carolina.



THE FEDERAL LANDS: Their Use And Management. By Marion Clawson and Burnell Held. 501 pp. Illustrated. 1957. Baltimore: The John Hopkins Press. $8.50.

THIS book is a highly authenticated volume on the use and management of U. S. Federal lands. Both authors are on the staff of Resources for the Future, Inc., where Dr. Clawson is in charge of the foundation's program of land use and management. This is the most complete treatise ever published on the subject of Federal lands.

Uncle Sam is the largest landowner in America. Nearly one-fifth of the Nation's land is federally owned. Federal lands include national forests, grazing districts, national parks and monuments, wildlife refuges, land utilization projects, submerged areas of the outer continental shelf, and others. The authors reveal how these acreages are used and managed and give illuminating facts on costs and returns.

Many of these lands are "tail end" areas that under private ownership, will not be tax assessed. Some are valuable oil, gas, timber, mineral, and grazing lands; other areas are important for recreational purposes. In the West, the most productive watershed lands are federally owned. Their economic importance increases yearly and methods of managing them need some revision.

The authors consider these changes, indicate what brought them on and examine various methods for improvement. They point out that improvements need to be made and recommend a full-scale reexamination of Federal land management.

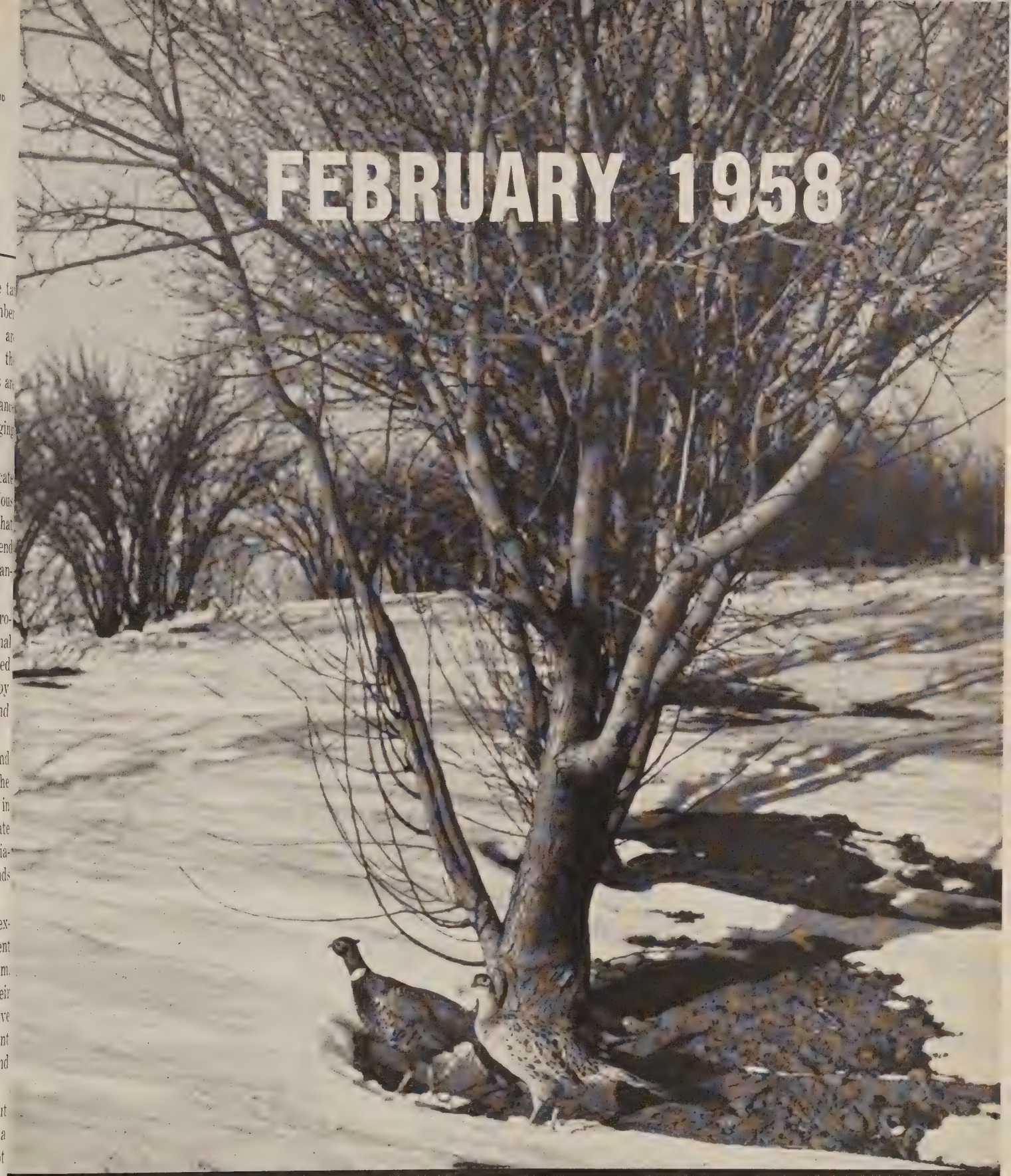
Federal land has been a subject of controversy ever since the federation of the original Thirteen Colonies. Clawson and Held have dived into the middle of this lively controversy by first recognizing that a valid problem exists, and second, by suggesting provocative remedies.

One suggestion is to form a Federal land corporation to manage all Federal lands. The corporation might resemble patterns already in use by the Federal land bank, the intermediate credit bank, or the production credit association. Other options for managing Federal lands also are considered.

The authors argue mainly for a critical examination of present Federal land-management processes in order to perfect a better system. They attempt no impregnable defense of their own ideas on the subject. In fact, they have made a clean-cut critique of the government corporation method of land management and point out obvious soft spots in the system.

Regardless of a reader's personal ideas about Federal land management he will find this a provocative book, which should stimulate a lot of productive thinking.

—B. W. ALLRED



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SOIL CONSERVATION

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SOIL CONSERVATION

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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SUMMER READING CLUB.—The Orangeburg Soil Conservation District and the Orangeburg County Library, S. C., sponsor a summer reading club for young people as a part of the conservation-education program. Last summer, 889 boys and girls participated in the program, and read 14,171 books. Each one, who read at least 5 books on conservation and 5 other books of his or her choice received a certificate: 593 certificates were awarded.

In addition to the reading club, three special conservation programs were arranged for the summer. Motion pictures were the main attraction at two of the meetings, while a special conservation tour and picnic was arranged for the third.

—R. H. HOLLEY

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Pheasants in a farm shelterbelt in the Palouse area of Washington.

—Photo by R. L. Kent

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The Soil Conservation District –

A Unique Tool For Democratic Action

By D. A. WILLIAMS

SOIL conservation districts were conceived a quarter of a century ago as a hopeful experiment in the mechanics of operating a national soil- and water-conservation program. Today, more than 2,750 such districts, blanketing nearly 90 percent of the Nation's farm and ranch land, have emerged as a unique example of successful Federal-State-local cooperation.

Nothing demonstrates this better than facts which turned up recently in a survey to determine how much non-Federal effort is going into the operation of soil conservation districts.

Twenty years ago the soil conservation program was financed almost entirely by Federal funds. This often meant that the Federal Government actually performed much of the needed conservation work on individual farms. The urgency of getting a nationwide job of this dimension underway justified launching it as a Federal program.

Beginning in 1937, soil conservation districts, organized under provisions of State laws, came into operation. They provided a means of insuring local direction and leadership in a program that had to be responsive to the needs and desires of local people.

Except for the gratis services of the farmers and ranchers elected or appointed to serve on district governing bodies, however, district operations at first depended almost entirely on services and facilities provided by the Federal Government.

Today it's quite different.

Technical help is still available to farmers and ranchers from the Soil Conservation Service, through these local units of State government. But a new factor has entered the picture. By 1957, when SCS made a study of the subject, *local and State interests (private and governmental) were contributing at least one-fourth of the annual operating costs of soil conservation districts.* This did not include any part of what individual farmers and ranchers spent in applying conservation measures on their own land. And the trend of local support for districts is clearly upward.

To me, this growing financial support of soil conservation district activities by non-Federal interests means two things:

First, the soil conservation program is getting tremendously effective help that we had not counted on in the early years of the job. Because of it, the Federal funds available for technical assistance are achieving perhaps a third more than would be possible without such support.

Second, soil conservation districts in two decades have thoroughly proved their effectiveness as tools for getting the soil- and water-conservation job done in a democratic way.

It is obvious that these soil conservation districts, run by and for local people, have won the confidence of community, county, and State leaders in government, business, industry, and other segments of our society. These leaders, and the organizations they represent, have discovered that by lending material as well as moral support to soil conservation districts, they are able to speed up conservation accomplishments at the local level and get more benefit from the Federal resources available to them for such work.

Most State governments are appropriating larger and larger sums at each session of their legislatures to help soil conservation districts carry on their work. These appropriations are used mainly to finance the State Soil Conserva-

Note:—The author is Administrator, Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C.

tion Committees (boards or commissions in some States). The committees, in turn, represent the State in program development in soil conservation districts and give administrative guidance to districts. In 1957, these State appropriations approached 5 million dollars.

In addition to the State funds, county and local funds and facilities, made available to districts through local government grants or appropriations and by contributions from business and private sources, amounted in value to at least 20 million dollars in 1957.

In some States, the counties furnish funds, which districts use to rent office space, purchase equipment, or hire clerical help.

In various other ways, local funds contributed by civic and municipal groups, business firms, associations, clubs, and the like are made available in nearly every soil conservation district. These funds are often used in such activities as field days, tours, workshops, and training courses. They pay for awards, prizes, and scholarships; for newsletters, reports, publications, and releases.

There is still another form of private help that is extremely valuable, the dollar-value of which can only be estimated broadly. This includes time, efforts, and expenditures of thousands of citizens who lend personal support to districts because they believe in this approach to an urgent problem.

We can only guess at the tremendous educational value of conservation subject matter in advertising sponsored by local firms in support of soil conservation district programs. A host of soil- and water-conservation activities —contests, awards, and recognition programs —are conducted by farm publications, newspapers, bankers groups, and others.

The officials of soil conservation districts themselves still serve without salary. And because of their interest, they serve also on important committees of State and national associations of soil conservation districts.

This development on the part of State and local interests, while it may have come as a natural consequence of the people understanding and appreciating the importance of soil and water conservation, received some helpful prompting. A few years ago, the National Association of Soil Conservation Districts set out to encourage organized community support of the program. It was called "The Program for Greater Service." The estimates I have cited here are proof enough that this activity has been successful.

We can look forward to still more help from non-Federal sources. In fact, I am convinced that the flow of such assistance has just begun. In some States, legislation has recently been enacted to permit county governments to make funds available to soil conservation districts. The amount of funds appropriated by the States themselves was materially increased during 1957, and we can expect still more help from this source.

Business and industrial firms are constantly on the lookout for ways in which they can give more effective help. There'll be ways for all of them to lend a hand—and a mighty useful hand it will be.

As the soil- and water-conservation program has moved forward, an increasingly large percentage of the total SCS appropriation has gone each year into the costs of supplying trained scientists to soil conservation districts. These technicians take help directly to farmers and ranchers who want to solve their soil and water problems.

The Federal Government cost of these services to farmers and ranchers in soil conservation districts in 1957 was just under 73 million dollars.

We calculate that non-Federal sources in 1957 were providing these same districts with help worth at least 25 millions—more than one dollar of non-Federal funds for every 3 appropriated by the Congress.

This is a bargain American taxpayers are getting for their Federal conservation dollar. It is a development that has come about slowly and that still has far to grow. And only recently have we come to appreciate the full significance of this development to conservation and to effective teamwork between Federal and non-Federal segments of our society.

This is a sign that the soil conservation district movement has come of age. It is fulfillment of the belief and hopes of those who 20 years ago saw in soil conservation districts a great new opportunity for democratic action in the best traditions of our Democracy.

Can You Afford To Let Your Farm Run Down?

By R. H. BLOSSER

AN Ohio study shows that if you let your farm run down you will find it extremely difficult to restore productive capacity unless you are a top grade manager or have extra capital to invest in improvements.

A typical run-down farm in southeastern Ohio was chosen for a 13-year study. The farm included 120 acres used principally for dairying. Soils and topography were roughly representative of about 15 million acres of hill land in southern Indiana, southeastern Ohio, and northern Kentucky. A soil conservation and improvement program was started at the beginning of the study. By the end of the 13-year period, it was felt that most of the expected benefits had been achieved.

Annual receipts, expenses, and net income were calculated each year for the entire period. The study showed definitely that a run-down farm can be improved. It also showed that it would be difficult for the average farmer to carry out such an improvement program if he had to depend on farm income alone to finance the necessary operations.

No terracing or contour stripcropping had ever been used on the farm before the soil conservation and improvement program started. Fertilizer applications on grain crops had never exceeded 100 pounds per acre per year. No fertilizer had been used on meadows. Very little if any lime had ever been applied to cropland and meadows. Consequently, timothy was the principal hay crop. Permanent pastures had never been limed or fertilized.

The acreages in various crops were not changed greatly during the 13 years. About 12 acres of corn, 14 acres of wheat, 34 acres of hay, and 36 acres of permanent pasture were grown each year. The remaining 24 acres were devoted to woodlands, farmstead, and miscellaneous uses.

Contour stripcropping was established early in the improvement program. An initial application of lime was made on all croplands, including meadows, at the rate of 4 tons per acre; maintenance applications of 1 ton per

Note:—The author is associate professor of agricultural economics, Ohio State University, Columbus, Ohio.

An improved 120-acre farm in southeastern Ohio that brings in about $2,700 labor income to the operator.

Part of a run-down farm in southeastern Ohio that brings in a labor income to the farmer of about $400 per year.

acre were made every 4 years thereafter. Fertilizer was applied to corn at the rate of 350 pounds per acre. For wheat, 450 pounds per acre were used. Meadows were top dressed with 200 pounds per acre after the first cutting.

On permanent pastures, 3 tons of ground limestone per acre were applied, followed by 1 ton per acre every 4 years. Fertilizer was applied at the rate of 600 pounds per acre every third year.

During the 13-year period corn yields were increased from 50 to 65 bushels per acre. Wheat yields were increased from 22 to 26 bushels. Hay yields were increased from 1 ton of timothy to 2.8 tons of alfalfa, clover, and timothy per acre. The carrying capacity of permanent pastures was almost tripled. The number of dairy cows supported by the farm steadily increased as did the productive capacity per cow.

Income figures for this and other similar farms show an average dairyman could expect to increase his labor income from $400 per year on the run-down farm to $2,700 per year on the improved farm, with prices and production costs calculated on the 1950-54 period. And a topnotch dairyman, selling milk on the grade A market, might increase his labor income to about $5,500 per year on the improved 120-acre farm.

Income figures show that with top grade management, (10,000 pounds of milk per cow and $4.00 net per hundredweight for grade A milk) soil building operations could be financed out of farm earnings in a few years. If labor were allowed no more than 75 cents an hour plus the use of a house, and if capital were paid 4 percent interest, annual cash receipts would exceed annual expenses after the third year. If all capital were owned by the farmer and no interest charge were made for using it, farm earnings would be sufficient to pay the average farm wage rate after the first year.

If increases in inventory are included in gross income, all costs of the soil improvement program could be recovered by the end of the third year. Also, after the third year interest and principal payments on borrowed money could be made out of farm earnings if no more

Typical unimproved pasture (above) where about 4 acres are required to support 1 dairy cow. (Below) An improved pasture where 1½ acres will support 1 cow.

than $2,500 were used annually for family living expenses.

With average management (7,000 pounds of milk per cow and $3.00 net per hundredweight for manufactured milk) about 12 years would be needed before annual cash receipts from the soil improvement program would exceed annual expenses, including charges for labor and 4 percent interest on capital invested. Seven years would be needed if the farmer owned all capital required and charged nothing for the use of it.

About 45 years would be needed to repay all previous costs if management were only average. If $2,500 were used annually for family living expenses, farm earnings would not be sufficient for the average farmer to make payments on interest or principal before the ninth year.

There are several reasons why annual expenses were greater than receipts during the early years of the soil improvement program. Costs of liming cropland were not completely recovered until meadow crops could be produced and then marketed through livestock. Several years were required before benefits of permanent pasture improvement were fully realized. Also, yields of rotated crops did not reach the maximum until the 13th year.

How then can the average farmer finance a major soil conservation and improvement program? He might do it by using capital on which no interest had to be paid. He might use some off-farm income to help support the family during the early years of the program. Also, the level of family living might be reduced to the minimum for a few years.

Yet, most farmers will find that over a long period of time a good soil conservation program will pay off. Soil depletion usually means lower yields, a smaller volume of business, and less income. More soil depletion means greater costs in restoring the productive capacity to a high level. Greater costs mean more financial difficulties, especially for the average farmer who just about breaks even on a good farm. It will be a difficult job to improve the run-down farm. It will be much easier to conserve and improve soil that is already productive. No farmer can afford to let his farm run down.

Oases On The Plains

Water Spreading Makes Green Fields Among the Brown Grasslands of South Dakota.

By JOHN T. LOUCKS

EXCELLENT results are being reported from the use of water-spreading systems over pasture and hay land in western South Dakota. Those who have been practicing this type of moisture conservation are well aware of the benefits. In years of average or above average moisture, it is not so easy to observe the differences in hay or pasture yields; but, during a summer and fall such as in 1956, the value of this practice is clearly visible to all who see the green fields on an otherwise brown, drab landscape.

Water spreading in this area consists mainly of diverting runoff water from spring thaws or flash rains out of draws or creeks and spreading it over grasslands or alfalfa fields. All too often this water just runs down a draw, into a creek, and on down into the main drainage where it is forever lost to the particular land on which it fell.

Why let this water get away? With the installation of a system of dams and spreader dikes and ditches, this water can be spread over a considerable acreage of grass or alfalfa. There the water is stored in the ground for later use by growing plants.

Although there was little or no runoff from snow last spring, and moisture from rains was limited, an area that had received additional water through a spreader system stood out like an oasis. The vegetation was taller and thicker and of a darker green color. The line where the extra water reached was clearly evident. In some sections, the only appreciable amount of hay produced was on areas where water was spread.

Note:—The author is area conservationist, Soil Conservation Service, Rapid City, S. Dak.

Contrast between flood irrigated (right) and non-irrigated (left) mixture of alfalfa and native grass in Meade County, S. Dak.

During the past several years, around 59,000 acres of water-spreading has been installed in the 10 soil conservation districts in southwestern South Dakota. Estimates by Soil Conservation Service technicians, district supervisors, extension agents, and ASC committees indicate that water spreading practices can be applied on another 38,000 acres.

Richard Williamson, a cooperator of the Elk Creek Soil Conservation District, recently spent $225 to build a single ditch to lead water onto rangeland. This was the first step in what will be a rather extensive water-spreading system covering about 200 acres. Enough floodwater was delivered by the ditch to permit Williamson to harvest $1,400 worth of western wheatgrass seed from the flooded area. This was in a pasture that was grazed throughout the growing season. No seed was produced elsewhere in the pasture. After the cattle were removed in the fall, the grass remaining on the flooded area could have been cut for hay.

John Wolken and his sons, Fred and Charles, who live in the same soil conservation district, have been systematically building dikes and ditches for 15 years or more. They have 8 separate systems, utilizing water from most of the draws which cross their land. Through the years they have spent around $6,000 building and maintaining ditches, dikes, and control works to utilize floodwaters on nearly 1,000 acres of range and hayland (both grass and alfalfa).

One fall, Wolken sold 800 tons of hay and 15 tons of alfalfa seed grown on land thus watered. A few years ago, Wolken built a system of dikes and ditches to spread runoff water on about a quarter section of native rangeland. Production the following year was remarkable, the grasses grew thick and tall and stayed green throughout the summer.

A hundred or more yearling steers grazed the area, and they were concentrated on that land when the unwatered grass began to dry and cure in the midsummer heat. The growth was so vigorous that even though the animals spent most of their time on it, the grass was not closely grazed. Production during that year was easily tripled because of the flooding.

Carl Erickson, of Creighton, built a water spreading system in 1951. The original cost of the system was $3,700 and it covers about 100 acres. Enough alfalfa seed is harvested off of the area each year to pay for the initial cost of the layout. In addition, the hay averages about 2 tons to the acre.

W. Nolan, of Buffalo Gap, had tried for years to raise alfalfa seed without much success. Now he has a water-spreading system on 160 acres, and says that his system makes the difference between seed or no seed.

Charles Stearns, of Provo, requested assistance in the development of a water spreading system in 1947. The first consideration was adequacy of water supply for the desired results. Runoff from 8,000 acres of the adjacent watershed were diverted into a diversion dam. The water-supply system was completed in 1947, and twenty-seven 6-inch weep pipes were installed to spill water onto the initial 200 acres of the project.

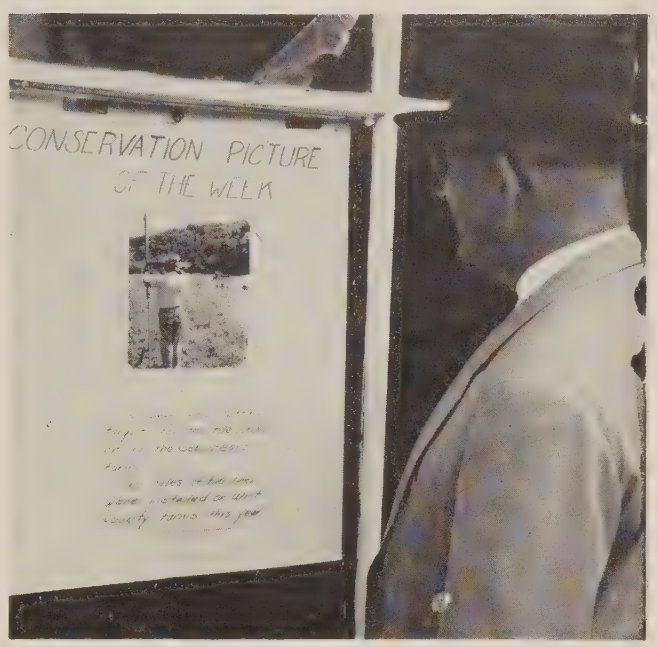
In 1948, the distribution system was planned and 35,000 feet of ditches, dikes, and a redistribution pickup ditch were completed. This was necessary to get an even distribution of water on the initial 200 acres, to add 200 acres to the system, and to make beneficial use of any surplus water, which runs off from the upper lines of the system. In 1949, 3,250 additional feet of spreader ditch were constructed to complete the project.

The construction work included 10.4 miles of ditches and dikes, with a total of 10,677 cubic yards. Earthwork construction cost $1,281. Gates, turnouts, and weeps were made from old well casings, corrugated pipe, and used lumber. Mr. Stearns also spent $350 for heavy work on repairing the diversion dam and main canal. The water spreading area consisted of native grassland, go-back land, and cropland. The entire area has been seeded to alfalfa drilled in existing cover. Following are some of the yields of hay and alfalfa seed from Stearn's project:

Alfalfa field in Meade County, S. Dak., that was irrigated by water-spreading system.

1954—100 tons hay @ $20 ton = $2,000 and 15,000 pounds of seed @ $33.30 cwt = $4,995.
1953—200 tons hay @ $20 = $4,000 and 24,000 pounds of seed @ $18.00 cwt = $4,320.
1952—164 tons hay @ $15 ton = $2,460 and 7,500 pounds of seed @ $35,00 cwt = $2,625.
1951—212 tons hay @ $15 ton = $3,180.

These are only a few of the many instances where operators report outstanding results obtained as the result of establishing water-spreading systems.



CONSERVATION COMES TO TOWN, by way of an ever-changing newsphoto display in windows of the *Wirt County Journal* at Elizabeth, W. Va. Fred Sturm, local businessman shown above, is among the hundreds who stop for a regular look at the latest nearby soil and water action. Schoolchildren, according to Editor "Woody" Wilson, watch the displays closely for a view of their own or neighboring farms.

The photos are also featured in the *Journal's* news coverage of doings in the Little Kanawha Soil Conservation District. Displays are arranged by Ross Mellinger, SCS work unit conservationist.

INCENTIVE AWARDS.—During the fiscal year 1957, incentive awards totaling $71,618 were given to 611 SCS employees. Of these, 209 were given for suggestions accepted, 370 for sustained superior performance, and 32 for special acts or services.

Tall Wheatgrass Replaces Foxtail and Kochia

Drainage Plus Tall Wheatgrass Have Brought Alkali Wasteland Back into Production for a Wyoming Rancher.

By HARLAN N. TULLEY

PETE Meike was one of the pioneer settlers and has been ranching in the Powder River country near Sussex, Wyo., for most of his life. Pete has seen the development of irrigated crop and hay land from the native grassland that originally existed on the first bench above the Powder River. Irrigation in the area around Sussex began with the building of the Sahara Ditch in 1902-07. This was the first irrigation to be done along the Powder River below the North Fork. Water was turned through the ditch in 1907.

Irrigation in this area produced bountiful crops for many years, and then alkali began to creep in. Shale parent materials below the soils of the area produced an abundance of alkali salts, which were brought to the surface by deep irrigation. On top of this, natural drainage, provided by buried creekbed gravels under the land, was closed off below. Subsequent irrigation built up the water table. Without an outlet for subsurface water, the land became boggy.

The story that now unfolds is an old one to many people of Wyoming, who can recite the sequence of events that transpired. The story includes infestations of foxtail barley, development of seep areas, "souring" of the land, and finally infestation with kochia, or burning bush.

The early 1920's produced the last good crop of hay on the Meike Ranch. Pete remembers using four horses to pull the empty wagons over the boggy ground to the field stack yard and eight horses to pull the loaded wagons out. Something had to be done to save the remaining land that was still producing a crop.

In 1944, Pete was instrumental in getting the Sussex Drain dug to provide an outlet for the excess water and to help dissipate the alkali

Note:—The author is range conservationist, Soil Conservation Service, Sheridan, Wyo.

Tall wheatgrass growing in a formerly unproductive alkali field on the Meike Ranch.

salts. This slowed the spread of alkali troubles and firmed up the boggy topsoil, but the areas already "alkalied" failed to improve. Pete and his neighbors were still confronted with the problem of trying to raise crops in competition with foxtail and kochia. Kochia came in about 1946 and has spread rapidly since then.

Some kind of hay grass or legume was needed, which would make satisfactory growth under the conditions existing and would compete successfully with the foxtail and kochia. Sweet clover would grow under these conditions, but it was not the most desirable hay. Being a biennial, it required working the soil and reseeding every 2 years creating a weed problem each time this was done.

Pete and his neighbors had the drain ditch deepened to gravel in 1952 making it more effective and far-reaching. At this time, he learned that tall wheatgrass was growing well under similar conditions elsewhere, so he decided to try it. With the advice of Soil Conservation Service technicians, he invested in enough seed that fall to plant about 18 acres. A dry fall, followed by a dry spring and summer, with scant irrigation water, was not conducive to good results. Despite all this, the seed germinated and grew. A good stand of tall wheatgrass resulted on about 13 acres, although there were some thin spots.

The really surprising thing, according to Pete, was that when the kochia came up in July and August it did not smother the wheatgrass. The second year, thirty-five steers were summered from about July 1st on the 13 acres. The thin spots had filled in with tall wheatgrass.

The third year, 13 bulls again summered on this patch, and 208 bushels of seed and about 400 to 500 bales of hay were harvested. Last year, the fourth, 248 bushels of seed were harvested from the grass plus 1,120 bales of hay and pasture for 50 rams from July 1. More land was planted last year with homegrown seed.

Palatability of tall wheatgrass is high as pasture or hay. Pete bales his grass hay and finds that sheep eat it eagerly. The cows eat the hay—stems and all. Sheep do not eat all the stems but do a good job on the leaves. Little waste is experienced in feeding this hay. Pete found that the year he pastured sheep on the

Pete Meike and sons inspecting the Sussex drainage ditch.

grass, the seed crop he harvested was practically weed free. This combination of pasture, hay, and seed production from the same land is ideal for this country.

The P/M brand livestock on the Peter Meike and Sons Ranch benefit from this high-quality feed. Running both Hereford cattle and Columbia sheep, quality of the herd is maintained at a high level, with bulls from registered herds in Nebraska and rams from registered Wyoming flocks. With these high-priced animals, a profit is realized only if the animals are kept in top condition and produce good lamb and calf crops.

When the Powder River Soil Conservation District was organized in the Kaycee-Sussex area to cover the south half of Johnson County

Sheep feeding from tall wheatgrass hay on the Meike Ranch.

in 1955, it was only natural that Pete Meike should be elected to its board of supervisors. The district is now engaged in plans for further improvements that can be made in production techniques and treatment of the land based on soil capabilities.

The pioneering efforts of the Meike Ranch are providing some of the answers that the district needs to solve problems of land treatment. With tall wheatgrass, a proved forage plant for the area, many acres abandoned to alkali and seeps may now be used for pasture and hay production. There is much hope that the next generation of ranchers will find things a lot easier along Powder River. Improved crop varieties and better understanding of proper land treatment indicates that these hopes can become reality.

Taming Wild Arroyos

Floodwater-retarding Structures at the Mouths of Arroyos Protect Irrigated Valley Lands.

By R. A. YOUNG

AS long as men have been farming the fertile valley of the Rio Grande in New Mexico, they have been plagued by floods originating in the hill lands. In the Hatch area, in the southern part of the State, such floods have been especially troublesome.

Here, as in many other parts of the valley, irrigation farming has been highly and expensively developed. Crops of corn, cotton, hay, and vegetables grow with vigor in the rich soil, aided by a warm sun and irrigation water at the right time.

In the Hatch area, the arroyos seem to be pointed at the farmlands to the west like a battery of cannons. Sudden rainstorms high up on the slopes 5 miles distant always brought trouble to the valley.

Note:—The author is State conservationist, Soil Conservation Service, Albuquerque, N. Mex.

At such times, the floodwaters burst out of the arroyos and fan destruction over the valley lands, sweeping over growing crops and dumping charges of gravel and sediment into irrigation systems. Proper grazing management of the hill lands wasn't enough; too much of the land was so steep and rocky that runoff could not be controlled by vegetation.

Farmers of the Hatch area in recent years had accomplished much in their effort to stem the rush of water from the arroyo slopes. Singly and in groups, using Federal and other help available at the time, they brought some of the arroyos under at least partial control.

However, much more needed to be done. The Watershed Protection and Flood Prevention Program, set up by Congress in 1954 with Public Law 566, provided the opportunity. This law makes it possible for the Department of Agriculture to cooperate with local organizations in solving watershed problems.

Completion of the first in a series of floodwater-retarding structures, the one spanning the "muzzle" of North Salem Arroyo, has been a milestone of a kind in watershed history.

The North Salem Dam, with its ungated outlet for the orderly release of floodwater, represents the first "sealed and delivered" contract under the new National program.

Two other floodwater-retarding dams now have brought needed protection from Ralph and Garfield Arroyos in the Hatch Valley Arroyos watershed-protection and flood-prevention project.

Silt collected above the North Salem Arroyo floodwater-retarding dam.

Upper side of the North Salem Arroyo floodwater-retarding dam soon after completion.

The Caballo Soil Conservation District lost no time in applying for help under the new watershed program. It promptly addressed a letter on November 4, 1954, to Governor Edwin Mechem asking for development of a plan for about 15 of the small arroyos that menaced valley lands.

When the district was formed 15 years ago, it cited the need for arroyo flood control as one of its most important objectives. Work that already had been done toward this goal carried much weight when the application for help by the Soil Conservation Service went forward.

Chairman Glen Ratliff, of the Caballo Soil Conservation District Board of Supervisors, outlined the problem this way:

"Most of the damage from arroyo water comes from the smaller arroyos, which simply end at the valley floor. When heavy equipment became readily available after World War II, farmers began leveling all their lands for irrigation. This had the effect of filling in many of the natural drains from the arroyos. The water now spreads over larger areas, heaping soil deposits and building fans. This new program is giving us the help we needed to go on with our job. We had done all we could."

The three completed structures have already started paying on the investment. Garfield Dam had four "runs" from summer storms.

The farm of Albert Franzoy, secretary-treasurer of the Caballo Soil Conservation District, is below one of the still-untreated arroyos. A July rain sent runoff dashing down the slopes onto Franzoy's place. His onion crop was damaged despite Franzoy's haste in getting the water off the field with big pumps.

"It never rains here but it pours," Franzoy sighed. "We need these retarding dams more than ever now."

The first 6 dams in the Hatch Valley Arroyos project represents an overall cost of $230,000. Damages, surveys show, have been averaging $14,111 a year. On a 50-year basis, benefits will outweigh costs 2 to 1.

As sponsoring agency, the Caballo Soil Conservation District is responsible for maintenance of the work. However, because of the program's importance to irrigation, the Elephant Butte Irrigation District has shouldered the upkeep burden and worked out an agreement with the Bureau of Reclamation for most of the actual work. The upkeep cost of the 6 structures in the Hatch Valley Arroyos project is estimated at $1,500 a year.

Work plans have been approved in Washington, D. C., for the remaining three retarding dams in the Hatch Valley Arroyos project. These are for the Velarde, Rodey, and Reed-Thrumond Arroyos.

Five other arroyos, the Underwood, Wasson, South Salem, Wardy-Hedgecock, and Hammett, are being planned for watershed treatment as the Caballo Arroyos project. A Soil Conservation Service survey and planning party is at work on them.

Grass-Seed Farmer

Grass Crops, Pine Trees, and Cattle Supplant Cotton and Corn and Prove to be More Profitable on a South Carolina Farm.

By J. B. EARLE

EVEN the nooks and corners are used wisely and treated well on the C. B. Reid farm in the Chester County Soil Conservation District, S. C. Last year Reid planted all odd corners and areas to pine.

Mr. Reid has for many years been following a soil- and water-conservation plan for his farm, which he prepared with the help of SCS technicians. The encouraging thing to him is that he now has most of his soil covered most of the time.

He grows crops in rotations and in combinations, and he is planning to overseed old stands of sericea lespedeza with fescue, ladino clover, and crimson clover. This combination will cash in on the fertility put into the soil by the sericea.

"You can grow anything you want in the summer following crimson clover," Reid said. He is a great believer in the two soil builders, sericea lespedeza and crimson clover.

"There was not a fence on this farm 10 years ago excepting one for a small hog pasture. It was a cotton and corn farm—no grass and no cows. Now it's a cattle and grain farm," he said.

Reid went into the lespedeza seed business in 1949. Since then lespedeza has been decreased. Now clover, ryegrass, fescue, Bahiagrass, rescuegrass, soybeans, millet, grain sorghum, and small grains are his main crops. He produces seed of all of these crops on his own farm, excepting rescuegrass. His most recent seed crop is Pensacola Bahiagrass. He planted a 2-acre seed patch of it last February with registered seed.

"There is a noticeable difference in the appearance of grain that follows soybeans," Mr. Reid said. "The extra nitrogen put into the soil by soybeans really makes grain grow, but I have to add some additional potash since the beans are heavy potash users."

Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.

The change has been from row crops to cows and conservation. His cotton allotment now is 21 acres, all of which is in the "Acreage Reserve" of the Soil Bank. He grows only one-fourth acre of corn in the garden. Small grain takes the place of corn. He likes it this way because small grain can be handled with machinery. It also grows in the winter when moisture is usually available and it protects the soil better than does corn.

As row crops decreased, grass and cows increased. He now has 50 Hereford cows and calves. His goal is 100.

"Fertilizer without good soil condition is useless. If the ground doesn't 'give' when you walk on it then it is too hard and needs organic matter," he said. The organic matter on this farm comes from grass, legumes, manure, and grain straw. No straw is burned; all of it is returned to the soil.

Reid owns 415 acres and rents 45 from his mother—260 acres of these are in pasture and seed crops. The other 200 acres are in loblolly pine.

Fred Mack, a consulting forester from Fort Mill, marks the trees when they need thinning. The stand is being managed for sawtimber by thinning as needed and by releasing the young pines by girdling scrub hardwoods.

Even the small bare spots of land on this farm

C. B. Reid and part of his cattle herd in an improved pasture.

are mulched with some type of straw.

Charles B. Reid, his wife, and their two daughters live in a modern home built in 1955. They enjoy beef from the farm and other fruits of their system of farming. He is not only active on his own farm but he is active in most community and county affairs.

"Progress is being made from the old ways to the new on my farm and in this community. It is hard to make a living from good yields and impossible to make a living from poor yields. Proper use and treatment of land are essentials if good yields are to be made," he believes.

"Two of the organizations that I represent—the Chester County Soil Conservation District and the Chester County Farm Bureau—are actively promoting a watershed-protection and flood-prevention project on the Rocky Creek Watershed in Chester County. The purpose of this project is to do a good job of using soil and water resources on all farms in the whole watershed area. In addition to conserving the farms, we hope to clean out the stream channels, stabilize road banks, and build flood-water-retarding dams," he said.

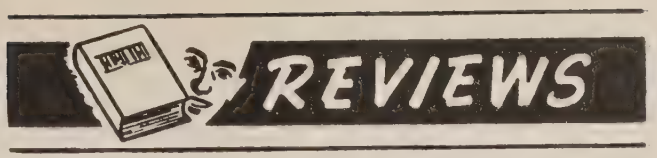
"This is a critical time for farmers in my area. While it is not a depression, there is a cost-price squeeze inflation that is putting farmers in a financial strain. I firmly believe that the farmers who survive this period will be those who have had a good conservation program on their farms for many years and who are now endeavoring to continue wise use of their soil and water. We need to produce more per acre at less cost.

"In 1946, I planted 100 acres of cotton and had 9 families of sharecroppers on the farm. Now I have no sharecroppers. I would not think of going back to the system I was following 10 years ago. The future looks better than the past," Reid concluded.

NITROGEN IN CORNSTALKS.—Cornstalks can be a valuable source of nitrogen, according to Fred E. Koehler, ARS agronomist, at the Scotts Bluff, Nebr. experiment station.

From 20 to 52 pounds of nitrogen per acre were found in the cornstalks and leaves in 5 fertilizer experiments on irrigated corn. The amount of nitrogen was influenced by the available nitrogen supply in the soil and the rate of application of nitrogen fertilizer.

Nebraska Experiment Station Quarterly



AMERICA'S NATURAL RESOURCES. By Charles H. Callison. 211 pp. 1957. New York: Ronald Press Company. $3.75.

HERE is a new book which the publisher correctly says, "Will be valuable to readers in many situations—to the voter, the farmer, the teacher, the legislator, the leader of public opinion. It is essential reading for all who have glimpsed the dangers threatening natural resources and wish to take intelligent action in their defense on community, State, or National level."

In sponsoring this book, the National Resources Council of America has rendered a real service to the American citizen. The contributors are a group of literary scientists who have conveyed their ideas objectively in a pleasing manner that can be understood by the general public. The authors assigned to write the various chapters are:

1. Conservation—Shirley W. Allen
2. Renewable Resources and Human Populations—Fairfield Osborn
3. Soil—Firman E. Bear
4. Water—H. G. Wilm
5. Grasslands—David F. Costello
6. Forests—Henry Clepper and Lowell Besley
7. Wildlife—Joseph J. Shoman
8. Fish—Albert Hazzard and William Voigt, Jr.
9. Parks and Wilderness—Howard Zahniser
10. Land Use Principles and Needs—Edward H. Graham
11. Needed: A Natural Resources Policy—Ira N. Gabrielson

This volume is an excellent source book—a depository of fundamentals and facts about our natural resources and what American civilization has done to them. It is deeply objective—resources are enumerated, destruction is evaluated, need is reckoned with, and sound methods by which our resources may be preserved are set forth.

—B. W. ALLRED

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SOIL SAVERS: The Work of the Soil Conservation Service. By C. B. Colby. 48 pp. Illustrated. 1957. New York: Coward-McCann, Inc. $2.00.

THIS is the most recent book in the Colby series that deals with important and interesting matters affecting American life. The entire book is devoted to soil conservation and the SCS. It is essentially a picture book developed along the lines of many children's books, with more than half the space devoted to pictures. Yet, it is very interesting and informative to adults.

Subjects discussed include most phases of soil and water conservation, from soil surveys and contour farming to flood detention dams and watershed treatment.

This book should find a place in all school libraries, and is one that might well be read by many conservation farmers and professional conservationists.

—TOM DALE

SOIL-PLANT RELATIONSHIPS. By C. A. Black. 332 pp. Illustrated. 1957. New York: John Wiley & Sons, Inc. $7.00.

DR. BLACK has converted to book form subject matter used in his course on soil-plant relationships at Iowa State College. The content is well-oriented and according to the author intended for students with considerable knowledge of soils, plant physiology, and general sciences.

The salient features of soil-plant relationships are explored with particular emphasis on the chief function of the soil matrix to supply needed mineral nutrients, moisture and oxygen, and anchorage for roots of higher plants.

Dr. Black points out that the principal scientific problems in the field of soil-plant relationships are those of measurement and interpretation. He adds that the basic conditions that affect the growth of plants must be measured, and the measurements then must be integrated in the proper manner to obtain an index to response of plants. The author's major emphasis is on measurement, and he has given readers a scholarly evaluation of this phase of the problem as he views it.

Modern concepts of soil chemistry and soil physics are projected to give a general knowledge of soil-plant relationships which can be applied in analyzing and interpreting specific situations. Overall principles and concepts have been put forth, and results of applied work are referred to only as examples. The book title could well be "Soil-Plant-Water Relationships" because of the large amount of excellent information on water as it is related to soil and vegetation.

—B. W. ALLRED

INFORMATION CONTEST.—The first annual soil conservation information contest for soil conservation districts will be held in Oklahoma during the calendar year 1958. The Oklahoma Press Association and Oklahoma Association of Soil Conservation Districts are the sponsors.

The 87 districts in the State are grouped according to the number of newspapers and magazines published in a district. Groups range from districts served by only 1 newspaper to those having 5 or more. Points will be given for feature stories, editorials, sponsored ads, district news columns, and scrapbooks. Plaques are to be awarded the winners in each group.

SMART OXEN.—Senor Placido Colon, a conservation-minded farmer in Puerto Rico, rents a team of oxen to neighboring farmers for plowing their land. But, Placido rents these oxen only to farmers that plow on the contour. He says his oxen do not know how to work the land excepting on the contour.

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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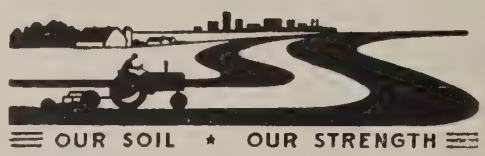


FORAGE SEEDINGS IN CORN.—The direction of the corn rows is important in establishing grasses and legumes in wide-planted corn, according to W. E. Larson of Iowa State College.

In tests, near Ames, Iowa, forage seedings often failed on the south side of 80-inch corn rows planted in an east-west direction. Due to the greater amount of sunlight, it was found that soil temperature was considerably higher (as much as 10 to 15 degrees) on the south side of the wide-spaced rows. Soil moisture was also lower most of the time.

Where the wide-spaced corn rows ran north and south uniform stands were established under otherwise similar conditions. Forage seedings between east-west rows at 40- and 60-inch spacings showed less variation than in the wide spacing.

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—The spring thaw gets underway in a mountainous watershed in Idaho.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

In The Indian Desert

A Report on Conservation Work Underway in the Semidesert Areas of India.

By W. M. NIXON

"WE are losing rapidly the precious topsoil which has taken nature thousands of years to build up. Along with the soil, we are losing enormous quantities of plant food, which results in ever diminishing crop yields. A heavy loss of fertile soil also is taking place every year on the banks of streams and rivers and on their upper reaches, resulting in a rapid rise of river beds and the consequent uncontrollable and destructive floods. Where dams are built across rivers, their life spans are shortened by deposition of silt and sand. Water tables are falling as the vegetative cover is indiscriminately removed and land which is irrigated by well water is thrown out of cultivation."

The above quotation is from the presidential address of Dr. J. C. Ghosh at the annual meeting of the Soil Conservation Society of India in 1956. It describes well some of the conservation problems confronting that Nation.

India, one of the world's largest countries, is faced with the problem of providing food, clothing, and shelter for 380 million people. The achievement of proper land use and the application of soil- and moisture-conservation practices is imperative. The International Cooperation Administration (ICA) through the U. S. Technical Cooperation Mission to India (TCM) is cooperating with India in this important work.

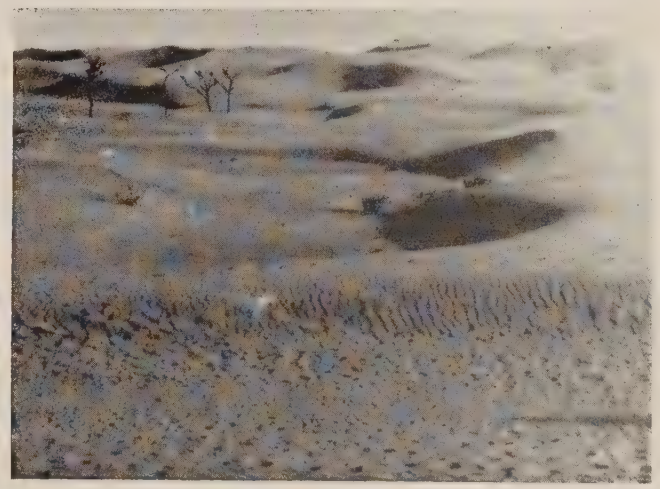
Dr. Frank W. Parker, formerly with the Agricultural Research Service, USDA, now chief agriculturist with TCM, and J. B. Davis, formerly with the Agricultural Conservation Program, deputy chief agriculturist of TCM, work closely with the Government of India on all phases of agricultural improvement including that of soil and water conservation.

Note:—The author is a soil conservation advisor of the U. S. Technical Cooperation Mission to India. Formerly, he was an agronomist with the Soil Conservation Service.

In 1956, the Indian Government, through ICA, requested the assistance of a team of soil conservation technicians. Alfred M. Hedge, formerly with SCS in Washington, was selected as the team leader. Other members of the TCM soil conservation team are Lloyd G. Signell, W. S. Speer, and myself, all formerly employed by SCS, and Benjamin Muirheid, formerly extension agricultural engineer at the University of Illinois. In addition, W. W. Hull, former SCS employee, and now with ICA, has been working with the Damodar Valley Corporation on soil conservation for nearly 4 years.

My assignment, to date, has been mainly that of soil conservation adviser to the Desert Afforestation and Soil Conservation Research Station at Jodhpur, in the arid and semiarid area of western India. This station was established in 1952 to develop methods of stabilizing the approximately 80,000 square miles of the Rajasthan Desert.

Mr. C. P. Bhimaya, who has had wide experience in soil conservation work in India and spent 2 years in the United States, directs the work of the Jodphur station. P. M. Dabadghao, station agrostologist, has also studied the grassland phases of soil and water conservation



Typical sand dune area in western Rajasthan.

Revegetation of sandy railroad right-of-way near Sikar, India.

in the United States and elsewhere. He is in charge of the grassland survey of India in addition to his work with the station.

The soils of Rajasthan are predominantly sands; the annual rainfall in the western portion of the State ranges from 5 to 15 inches. All of the effective rainfall occurs during July, August, and September. Water is scarce, with many wells being from 300 to 400 feet deep. Water is not available in some parts of the area and where found, in most instances, is saline.

The vegetation is of a desert-shrub type, though at one time parts of the area probably were of a Savannah type. Herds of cattle, sheep, goats, and camels graze the year round and are gradually destroying what was once a good protective vegetative cover. Much of the land has been plowed and severe duning has occurred throughout the area.

The best available information indicates a present grazing rate of about one animal unit per 3 acres the year long. This is obviously at least 3 to 4 times the proper stocking rate.

Few wind erosion control measures have been practiced on cropland and many of these fields today resemble our "Dust Bowl" of the 1930's around the Dalhart, Tex. area.

The desert research station has developed and demonstrated effective methods of sand dune stabilization, roadside tree planting, tree and shrub establishment on grazing lands, and the natural regeneration of pasture lands by protection against overgrazing.

The station is now initiating soil- and water-conservation research work and field trial demonstrations on pasture and cropland. Moderate stocking, deferred-rotation grazing, seasonal deferment, water development, and some artificial seeding will be the major practices applied to grazing lands. Field windbreaks, stripcropping, crop-residue management, mulching, bedding crosswise to the prevailing winds, and other wind erosion control measures will be tried on cropland.

Good shrubs, forbs, trees, and perennial grasses are still to be found in this region, despite the long history of abuse. Among the native perennial grasses are Pennisetum ciliare (buffelgrass), Cenchrus setigerus (birdwood-grass), Andropogon annulatus (Klegerg bluestem), Panicum antidotale (blue panicum), and Elyonurus hirsutus (balsamscale). These tall grasses yield productively in the 5 to 15 inch annual rainfall area. The first 4 have been introduced into the Southwest United States and are doing well in Texas and elsewhere.

Some of the good native trees and shrubs are Prosopis spicigera, Acacia arabica, Azadirachta indica, Zizyphus jujuba, Zizyphus nummularia, Tecoma undulata, and Albizza lebbekoides.

Dryland field crops grown are chiefly millets, sorghums, wheat, peas, beans, mustard, and guar.

The pressure upon the land is very great in India. A high percentage of the land must be used for food production. Hence, most of the

Revegetation of sand dunes in western Rajasthan.

sandy soils in the 10 to 15 inch rainfall belt will be cultivated, though their capability for such use is questionable. The objective on these lands is to encourage and assist farmers to use soil- and moisture-conservation practices to the greatest possible extent. Where below 10 inches of rainfall occurs, dryland cultivation is hazardous and unprofitable. It is believed that these lands should remain in a protective cover of perennial vegetation. With controlled livestock production, these areas will make a sizeable contribution to the present and longtime economy of India.

Since meat is not an important food in India, emphasis must be placed upon the yields of wool, mohair, milk, and other livestock products.

Improved native grass range near Jodphur, India.

It is going to require a lot of leadership, determination, ingenuity, and hard work by all concerned to get proper land use accepted and soil- and water-conservation practices applied and maintained. However, this must be done. It will not happen in 1 or 2 years, but a start is being made, and I am confident that farmers and graziers will become conservation-minded when it is demonstrated to them that it will mean a better living for their families and themselves and for India as a whole.

Again quoting Dr. Ghosh, "I cannot think of any other job which can confer greater benefits to the common man of India."

Grass As Operating Capital

By HUGH HILLER

ALLEN SMITH of Kadoka, S. Dak., says: "I found out the hard way that it is false economy to take more than half the grass that nature produces. The half you leave is the reserve you need to keep going. It is like operating capital."

When Mr. Smith began ranching on a small scale, his range was in poor condition due to continued heavy grazing. Many of the most desirable species of grasses had been destroyed. Low producing, unpalatable grasses and weeds had taken over.

Grass management on his ranch has been a difficult and complex problem, since there are many types of soil. Types range from heavy Pierre shales and heavy clays on the higher lands to unstable sands along the White River. Slopes vary from less than 1 percent to more than 30 percent. Each of these soils grows a different mixture of native grasses, and each soil reacts differently to opposing forces of erosion and grazing.

"Even the rainfall cannot be depended on," says Smith. "It varies from less than 9 inches to as high as 20 inches annually, with an average of around 14 inches."

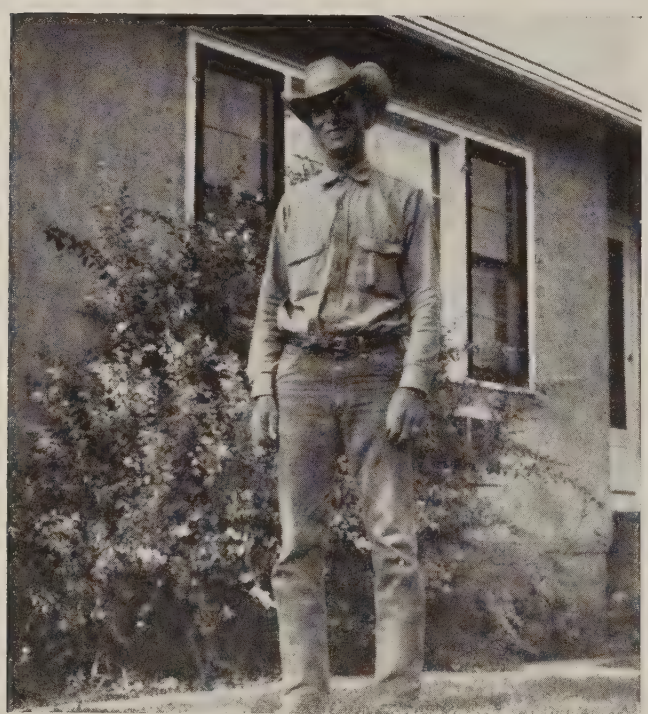
Using the soils as a basis for management, Mr. Smith, in cooperation with technicians of the Soil Conservation Service assisting the Jackson-Washabaugh Soil Conservation District, has set up each soil type in a range site. Each of these sites or soils has a different ability to produce vegetation.

Plants choose the soil on which they grow, and technicians who have studied grasses and soils know the compatibility of the different types of grasses and soils. This information on compatibility can be obtained only by careful examination of the species on a given range site, but when it is obtained suggested grazing rates can be made.

Note:—The author is work unit conservationist, Soil Conservation Service, Kadoka, S. Dak.

While it was impossible for Smith to isolate each range site by fencing, similar sites were grouped together where possible and treatmnt was given to that group. Various treatments were needed.

"Resting is one of the important treatments and the one that paid the biggest dividend," Smith says. Nearly every year now, at least one of his fields is rested. This gives the desirable grasses an opportunity to get a good start ahead of annual weeds and less desirable grasses. By this process, the desirable grasses become more firmly established and there is less chance for invasion by less desirable plants. This treatment has a very important side benefit of producing a good mulch on the soil to catch and hold moisture.



Allen Smith.

Deferred grazing is a modification of resting. The pasture is rested only a part of the year—usually early in the spring. This practice was almost as effective as resting for Smith.

Water for plants and animals is indispensable. Many parts of the range were not grazed because livestock did not have ready access to water. This has been remedied almost entirely with stock dams constructed at strategic places where cattle must travel to get to other parts of the range. Many of these dams are large and will store a 2-year supply of water to tide over a dry year.

Salt is also used to take cattle to parts of the range they would otherwise not graze. When stock go for salt they usually graze the area for some time before leaving.

Good grass is a fundamental to a good livestock program, but top quality livestock and a good supply of winter roughage are essentials. These essentials are well-planned and executed on Smith's unit.

He has consistently used top-quality sires and has followed a rigorous program of culling poor animals. During breeding season he has cows and bulls in excellent pastures, using one bull to 25 cows. This plan gives him his complete calf crop within 40 days. When it comes to marketing calves, this practice pays off. The bunch is more uniform and thus brings a higher price. He has had a 98 percent calf crop many years and has often topped the market with his calves.

Winter feeding is not a serious problem on this ranch as there is always plenty of hay. Mr. Smith has taken advantage of practically all the water that falls and flows onto his land. The large creeks, which flow onto his bottom lands, have been controlled and the water is used in water-spreading systems to increase hay production. Where this extra runoff is available, tame grasses and legumes have been seeded and the production of forage is many times greater than before. The hay is stacked in naturally sheltered areas in the bottom lands where it is easily accessible for winter feeding. Nearly every year Smith has at least one year's supply of hay left at the end of the feeding season. His aim is to be 2 years ahead in supply. That second year reserve may be just enough to keep him in business if severe drouth hits.

Mr. Smith does not make claims to glory for his accomplishments. "Good conservation is good business," he says. His greatest satisfaction is in producing and marketing the highest quality beef and having his range covered with vigorous and nutritious grasses.

Sportsmen Are Sport-Makers

West Virginia Clubmen Demonstrate That Improvement of Wildlife Habitat Through Conservation Practices Will Increase Both the Quantity and Quality of Wildlife.

By LESTER FOX

MEMBERS of the Hancock County Sportsmen's Association of West Virginia were beagle fans. Their main trouble was they had no way of training their dogs. There weren't enough rabbits in the countryside to go around.

Game men advised them they couldn't exactly make rabbits; but, there were ways to make more flop-ears feel at home.

They bought a 167-acre eroded, rundown hill farm near Weirton for $2,500 and started to fix it up for rabbits. The project grew until today the farm is a haven for several kinds of wildlife and a model for conservation.

Other groups have followed the pattern. Boy Scouts, Girl Scouts, and others have lined up with the sportsmen, planting trees every year and studying conservation on the association's farm. Club members give talks on conservation before organized groups, and they encourage farmers to join the North Panhandle Soil Conservation District. Those who do this get fishing rights to club ponds. As a result, nearly all farms include wildlife conservation.

It was with the soil conservation district that the sportsmen started their whole project. Through their President, Edward T. Rowland, they agreed to practice conservation on their club farmland. The agreement has brought them technical help from the Soil Conservation Service and from game managers of the State Conservation Commission.

In the first year of operation, the club cleared 50 acres of almost worthless trees and brush. Workers piled the cut material around the area for rabbit shelters. The club also planted 5,000 trees and shrubs. It built 3 ponds for fishing. Two of the ponds failed to hold water but they were later sealed with bentonite.

Club workers also disked, limed, and fertilized a strip a mile long and 25 feet wide. They

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

Club members training beagles on the Hancock County sportsmen's farm.

A brush pile that provides cover for rabbits on the Hancock County sportsmen's farm.

planted the strip to annual grains to produce wildlife food.

The next year they again plowed, limed, fertilized, and seeded the strip to grass. They planted another strip a mile long to mixed grain for wildlife food. The pattern has been repeated every year since. Between strips of grains and grasses, they planted perennial shrubs of value to wildlife.

The club intensified the rest of its conservation work. It has now planted about 50,000 trees and shrubs. It has cleared more land and piled up more rabbit shelters. It has fertilized its ponds regularly to keep fishing at its best. Corn, wheat, and barley production has come into the program on a limited scale.

A nearby farmer has been doing much of the actual work. He takes his pay in the crops he harvests.

"In 1955 we felt we hit the jackpot," said Gust Brenda, who succeeded Rowland as club president. "That was the first year we operated in the black. We made between $400 and $500 above our costs."

The club members themselves have put in many hours of work without pay. They have been out-of-pocket in travel and other expenses in helping to carry out the club's unusual program. They regularly brave the wintry blasts to put out feed for the farm's wildlife.

Now the club is in the Christmas tree business. Their 15,000 Norway spruce and Scotch pine are maturing. About 100 of them were ready for market in the 1957 Yule season. The harvest will get bigger each year. "We'll replace all that we remove," Brenda said.

So, with a couple of thousand dollars a year from its hay and grain, plus its Christmas tree sales, the club expects to start reaping the financial benefits of conservation.

"Of course," said Brenda, "we are concerned more with conservation, as such, than with making money out of it. Our farm has been a sort of research center where we and professional conservation workers could try out various things. And we are a sort of education institution, you might say. We're proud of our work with the farmers and Scouts.

"On the Sunday preceding Arbor Day each year we have a big tree-planting ceremony on the farm. In 1955, 125 youngsters took part. Last year more came out. Their parents were there too. So were a lot of other grownups who wanted to learn something about conservation. On top of that, our members have become quite

Contour stripcropping where strips of grass or small grain are grown between bands of shrubs that provide food and cover for wildlife.

expert in giving public talks on conservation. For a small club of only 140 active members, I think we've done quite well."

No hunting is allowed on the club's farm, only beagle training. But members and invited farmers are getting a lot of year-round bass and bluegill fishing in the ponds. And many members are getting pleasure out of the beauty of the improved landscape and hearing the many songbirds that have taken up residence.

What about the rabbits? William Santonas, district game manager of the State Conservation Commission, has made regular checks. He found an increase from 116 rabbits in the spring of 1954, to 187 in the spring of 1956; from 202 in the fall of 1954; to 256 in the fall of 1955.

The number and kinds of songbirds also increased. Among 75 species now using the club's farm are the meadow thrush, cardinal, chickadee, titmouse, and catbird.

"This was a good test case," Santonas emphasized. "Some sportsmen believe that the only way to increase useful game is to kill off the predators. Others believe you have to provide the habitat and then the useful game will take care of themselves. We have shown that the 'habitat' idea is right. This piece of land proves it."

In Quest Of The Golden Plow

Contestants From 14 Nations Compete in the Fifth World Plowing Contest and Observe Soil- and Water-Conservation Practices in Southern Ohio

By A. B. FOSTER

MEMO to interplanetary explorers: "Don't forget to take a plow!" Thus, Alfred Hall of Great Britain, General Secretary of the World Ploughing Organization, set the tone of the 1957 World's Conservation Exposition and Plowing Contests.

And, significant this might well be, because the plow has come to be known as the symbol of peace everywhere. The plow—the key that unlocks the fertility of the soil—remains a basic instrument of food production the world over.

It was the humble plow that brought together representatives from 14 nations to compete in a friendly but spirited contest on a 2,500-acre site near Peebles, Ohio, 65 miles east of Cincinnati.

Also known as the "World's Fair of Agriculture," this event gave 16 farmers in Adams County, Ohio, a chance to show the world what soil and water conservation really means. For this was America's first opportunity to be host for the world plowing matches. And it is no coincidence that it was the first time that soil- and water-conservation practices were associated with these matches.

Every one of the 16 farms on which the contests were held has a complete soil conservation plan. The owners are all cooperators with the Adams County Soil Conservation District. General Chairman of the event was Earl K.

Anne Lane, Queen of the Furrow, and D. A. Williams, Administrator of the Soil Conservation Service.

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

Devore, Adams County dairy farmer, and chairman of the district board of supervisors.

Robert C. Barre, area conservationist, SCS, at Hillsboro, was co-chairman and one of the judges. Edwin Weaver, work unit conservationist, SCS, West Union, was a member of the board of trustees in charge of the wagon tours.

While the State, national, and finally the world plowing contests attracted a lot of attention during the 4 days, wagon tours took nearly 75,000 people around 2 marked routes where Soil Conservation Service, State conservation department, and Extension Service personnel explained pond building, terraces and diversions, stripcropping, fertilizer treatment, woodland management, wildlife management, and altogether 23 different soil- and water-conservation practices that go into making a farm conservation plan work. The two combined wagon tours were more than 4½ miles in length. Total attendance for the 4 days was over 250,000.

Over 200 wagons pulled by tractors furnished by various equipment dealers and driven by FFA and 4-H members and other volunteers carried the sightseers in an almost endless parade around the marked routes. Each tour was marked out on a map of the exposition area. Each conservation practice was marked on the route and described in the tour leaflet. Over 30,000 of these tour leaflets, printed by the National Association of Soil Conservation Districts, were handed out.

At each station the speaker gave a brief talk on what was going on there. Some of them handed out additional material. For example, at the spring development site a job sheet on how to plan and install a system of tile, collection basin, and tank was given to all who were interested.

The first world plowing contest was held at Cobourg, Ontario, Can., in 1953. In 1954, it was held at Killarney, Ir. The matches were held at Uppsala, Swed., in 1955, and 1956, at Shillingford, Oxford, Eng.

Fourteen nations competed at Peebles: United States, Norway, Northern Ireland, Denmark, Germany, Canada, Great Britain, Belgium, France, Italy, New Zealand, Sweden, Finland, and Holland. Each country had two entries.

The National Association of Soil Conservation Districts and the Ohio Federation of Soil Conservation Districts sponsored the 1957 event.

William de Lint of Holland won the championship with John Mason of Great Britain finishing second.

The two American competitors, Lawrence Goettemoeller of Ohio, and John Daniels of

Spectators at the World Plowing Matches on a wagon tour to observe conservation practices in Adams County, Ohio.

John Mason of Britain winning second place in the stubble plowing contest at the World Plowing Matches.

Illinois, finished 9th and 21st respectively. Goettemoeller had won the United States level land match the day before. Another Ohio plowman, Duane Moots, won the national contour plowing contest.

The list of conservation practices completed on the 16 farms before or during the exposition included: 253 acres of stripcropping, 158 acres of contour cultivation, 953 acres of conservation crop rotation, 227 acres of pasture seeding, 293 acres of pasture and meadow improvement, 111 acres of woodland protection and improvement, 8 acres of tree planting, 17 acres developed for wildlife, 890 rods of hedgerow planting, 824 acres of farm drainage, 600 rods of closed drains, 19 acres of grass waterways, and 35 acres of land clearing.

In addition, there were 7 new ponds and 3 older ponds where fish management was being practiced, 3 spring developments, 4 drop-inlet structures, one sod chute, 6 miles of diversion terraces, and 1 mile of open ditch drain.

Several irrigation sprinkler systems were in constant operation using water from the finished ponds.

One pond, requiring the movement of 4,500 cubic yards of earth, was built during the contests. Another pond that contained 3,200 cubic yards had been built in 1956 and was used as a demonstration area for wildlife management by the Ohio Division of Wildlife.

There were so many side attractions that it would take a book to list them all.

More than 1,100 people rode the 55-mile air tour over 3 counties. More than 1,200 aircraft landings and takeoffs were made from the 3,000-foot airstrip shaped from one of the farmer's fields and built across a State highway to get the needed length.

Ten million dollars worth of commercial exhibits—mostly farm equipment—were displayed. And so it went.

The "Golden Plow" trophy that went to the winner will remain in his possession for a year. In order to observe strict impartiality toward the farm machinery industry throughout the world, the 18th Century Norfolk Plow—a walking plow mounted on two wheels—was chosen as the model for the golden replica mounted on the trophy.

The inscription on the Golden Plow trophy reads "Pax Arva Colat", meaning "Let Peace Cultivate the Fields."

THE GREAT PLAINS.—The Great Plains Conservation Program is one of the most significant undertakings in our agricultural history. In this vast area we are bringing together all our resources—local, State, and Federal—in a coordinated effort to help farmers and ranchers solve complex land-use problems that affect the national welfare.

D. A. Williams, *Administrator*
Soil Conservation Service

SOIL CONSERVATION DISTRICTS are instruments of State government through which people attack, in an organized way, not only their own individual conservation problems but at the same time the community problems. They provide a mechanism by which the assistance of a Federal department can be kept in the hands of local people and responsive to their needs.

Ezra Taft Benson,
Secretary of Agriculture

Runoff From Small Watersheds

No. 31

This is the thirty-first of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By JOHN A. ALLIS and LUDWIG L. KELLY

THE effect of different crops and farming practices on runoff from field-size watersheds has been measured by the Agricultural Research Service in cooperation with the Nebraska Agricultural Experiment Station at the Great Plains Experimental Watershed near Hastings, Nebr. It was found that on an annual basis, both the total amount and the peak rate of runoff were significantly affected by the treatment and use of the watershed area.

During the 9-year study, 1946-54, 21 cultivated watersheds, 2 native meadow watersheds, and 1 native pasture watershed were used in the tests. Each watershed was about 4 acres in size with silt loam soils developed from deep loessial material. Average land slopes were about 5 percent.

The soils, slopes, climatic conditions, crops, and farming practices tested are representative of about 70 counties in south central Nebraska and north central Kansas. With some modifications for differences in climate and soils, the results could be applied to an even broader area.

The cultivated watersheds were farmed in a rotation of corn, oats, and wheat under straight-row tillage, contour tillage, and subsurface tillage. During the 9-year period there were 3 cycles of the rotation. There were duplicate or triplicate watersheds in each of the 3 crops and farming practices each year. Farming operations were carried out in a manner typical of the average farm in the area.

Note:—The authors are respectively, project supervisor, Hastings, Nebr., and hydraulic engineer of the soil and water conservation research division, Agricultural Research Service, Beltsville, Md.

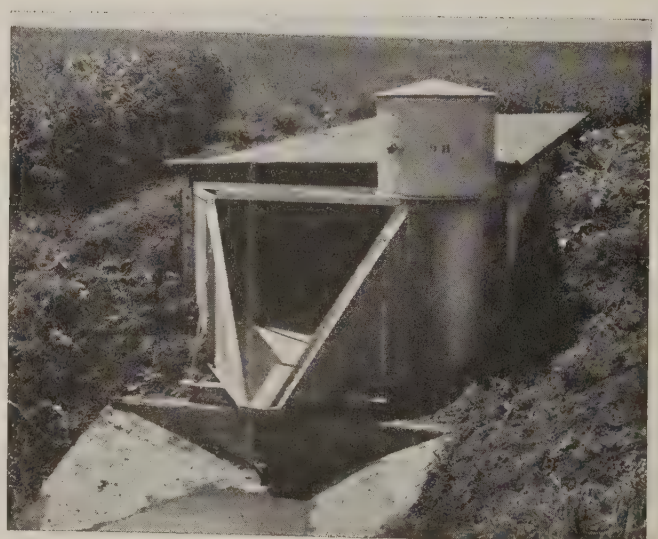
The pasture watershed was moderately to heavily grazed. The two meadow watersheds were mowed annually.

Runoff was accurately measured for each watershed with a precalibrated flume.

During the 9-year period of the tests, the average annual rainfall was 23.55 inches. This compares closely with the 63-year average at Hastings. The proportions of wet, average, and dry years occurring during the 9-year period also followed closely the 63-year period of record.

From the average straight-row watershed there was an accumulated runoff of 42.1 inches per acre for the 9 years, or about 4.7 inches per year. From the subtilled watersheds there was a total runoff of 34.4 inches per acre, or about 3.8 inches per year. There was total runoff of 29.2 inches per acre from the contoured watersheds, or about 3.25 inches a year. In average annual amounts there was 1.4 inches less runoff from contoured areas than from straight-row areas; .9 inch less from subtilled areas than from straight row areas; and .6 inch less from the contoured than from the subtilled areas.

The effect that the cultural practice may have on the runoff from individual crops was ana-



A flume used to measure runoff from a 4-acre watershed.

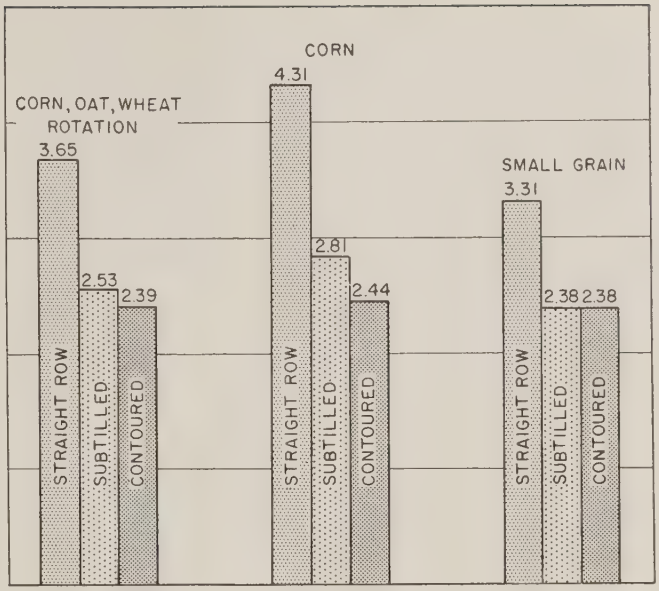
lyzed and compared also. It was found that for corn the average yearly runoff was 4.8 inches from areas planted and cultivated in straight rows, 3.7 inches with subtillage methods, and 2.9 inches from contoured areas. There was more than an inch less runoff per year from the areas in subtilled corn, and almost 2 inches less per year from the areas in contoured corn than from the areas in straight-row corn. The subtilled corn was planted on the contour, with a surface planter, while the straight row and contoured corn was planted in deep lister furrows.

No significant difference was found between the runoff from wheat and oats; therefore, data from these crops were treated as 1 crop in considering the effect of the type of farming practices. The average yearly runoff was 4.6 inches from areas planted in straight rows, 3.9 inches from areas planted with subtillage methods, and 3.4 inches from areas planted on the contour. The differences here were not as great as those for corn under the different cultural practices. One reason is that the small ridges and furrows left by the grain drills and other machinery operating on the contour do not provide the detention storage that the lister planting of corn does. Field observations indicated that there was some "carry over" effect of the lister planting and tillage of corn because the disking and planting of grain on the contour did not completely level the ridges left from the contoured corn.

Runoff from the native pasture was 19.8 inches per acre for the 9 years averaging about 2.2 inches per year. From the meadows the 9-year runoff was 3.54 inches per acre averaging .4 inch per year.

These results illustrate the striking differences in water yield to be expected from areas in different land uses and cultures. The range is from the low of .40 inch per year from the meadow areas to the high of 4.8 inches per year from the areas in straight-row corn. Of interest, too, are the extremes of individual watersheds. One of the straight-row watersheds had 48 inches of runoff in the 9 years, while one of the contoured watersheds had but 18 inches.

The various crops and practices also showed significant differences in the maximum rates of runoff. The peak rates of runoff were calculated for each field each year on an inches-per-hour basis, though the peak rates usually lasted for only a few minutes. The peak rates for each of the 9 years were averaged to get an annual peak rate of runoff.



Average annual peak rates of runoff from 4-acre cultivated watersheds at Hastings, Nebr., 1946-54, shown as inches per hour.

It was found that the average annual peak rate of runoff from all the cultivated fields could be reduced from 3.6 inches per hour to about 2.5 inches per hour by contouring or subtilling.

Considering only the watersheds in corn, the peak rate of 4.3 inches per hour from straight-row areas was reduced to about 2.6 inches per hour by either subtilling or contouring.

Peak rates from areas in small grains were reduced from 3.3 inches under straight-row farming to about 2.4 inches per hour by either subtilling or contouring. These reductions are all statistically significant.

The average annual maximum rate for the meadow watersheds was .67 inch per hour and for the pasture watershed, 1.1 inches per hour.

Peak rates for individual watersheds varied considerably as did the peaks for different years. The greatest annual peak recorded in the period was 7.7 inches per hour produced by a watershed planted to corn in straight rows. The lowest annual peak for a cultivated watershed was .34 inch per hour produced by a contoured watershed in a year it was in corn. The greatest

annual peak from a meadow watershed was 1.9 inches per hour, and the lowest .01 inch per hour. The greatest for the pasture watershed was 1.9, and the lowest, .64 inch per hour.

In terms of crop value, it was found that the average gross return per acre from the contoured areas was $3.60 more than from the straight-row areas, and the gross return from the subtilled areas, $1.70 more than from the straight-row areas.

The findings of these watershed studies have application to many problems in soil and water conservation. These include problems both of designing programs to retain as much of the precipitation for crop productions as possible, and of designing dependable water supplies and soil- and water-conservation structures.

A Conservation Irrigation Farmer

By ERNEST O. HILL

EULYS E. BARTEE, secretary-treasurer of the Socorro Soil Conservation District in New Mexico, began his conservation work in March 1950, when he became a cooperator of the district and leveled half of his home place. He purchased this 30-acre farm in 1949 and leased 124 acres.

Bartee has been influential in getting needed conservation practices applied on his leased land as well as on his own. He received a conservation award in 1954, from the First State Bank of Socorro. This was the year he installed 35 irrigation structures and completed his crop rotation and crop residue management practices. His land had all been leveled by the end of 1953. He completed rebuilding his irrigation system and improved the application of irrigation water by 1954.

Eulys grew up on a small farm in Mississippi and divided his time between the farm and his father's store. He followed the slogan of "go west, young man" and migrated to Sudan, Tex. early in 1935, where he started farming 500 acres and by 1948 was farming 1,000 acres. He says the Sudan area developed from dry farming to a dryland-irrigated area.

Bartee moved to Socorro, in 1949, and started producing Duroc Jersey hogs. His herd, including feeders and breeding stock, numbered as high as 300 at one time. During 1951, he went into the dairy business and sold all of his hogs, because sanitary requirements did not permit a combination of the two.

Eulys Bartee (right), and son Mac look over their hay crop.

His dairy herd totaled 7 cows in 1951 and grew to 20 head by 1952. He now owns 100 head of Holstein cows and replacement heifers and 3 registered Holstein bulls. Bartee converted his dairy plant from a milk-can operation to a pipeline-tank setup in September 1955. He fertilized all of his acres with as much manure as the land could use and traded the remaining manure for corn.

Eulys Bartee is not only a leader on conservation affairs but is a leader in other community activities as well. He is president of the Socorro Rotary Club, has served as chairman of the Socorro County fair board, as a member of the school board, and is one of the directors of the Middle Rio Grande Conservancy District.

Note:—The author is work unit conservationist, Soil Conservation Service, Socorro, N. Mex.

From Brush To Grass

Brush Clearing, Reseeding, and Grazing Management Convert a Hawaiian Brush Patch into a Ranch Showplace.

By ROY L. SHIPLEY

TURNING a brush patch into a money-making ranch in less than 4 years is a tough job even for old hands. But when Adolph Mendonca, a Honolulu real estate developer, came along and did the trick, it gave real zip to ranching in Hawaii's Molokai Soil Conservation District.

You'd have to credit Mendonca with a lot more than "effort" for it wasn't just desire that made things go. He rates pretty high on know-how, too.

A partial list of the accomplishments of Mendonca and his Manager, Gene Robins, on the Kalae Ranch, since 1952, include:

1. Increasing the herd from 100 cows, calves, and young beef animals to around 600 head of better-grade livestock.
2. Boosting average weight of cows from 700 to 1,000 pounds.
3. Increasing the calf crop from 60 to 95 percent.
4. Getting 175 lbs. per acre per year from 14 acres of improved range, or a gross of $43.75 per acre per year. The old brushland forage produced only 29 lbs. of beef per acre.

Soon after Mendonca leased the 1,400 acre Meyer Ranch on Molokai he hired Robins as manager. Robins came to Kalae from the Hawaiian Homes Commission, where he gained wide experience in range improvement and livestock management.

"When Gene and I took a good look at that brushland," says Mendonca, "we nearly threw up our hands. Grazeable portions were covered with guava, a troublesome brush pest. Along with guava, as understory, we had such low-producing plants as Hilograss, yellow foxtail, and many weeds.

"Also, some of the steep lands were covered

Note:—The author is range conservationist, Soil Conservation Service, Boise, Idaho.

Breeding herd of livestock on the Kalae Ranch.

Clearing brush on the Kalae Ranch.

by guava and staghorn fern. Stock found it tough pickings in those thickets.

"One of the first things we did was to contact the Molokai district board, Soil Conservation Service technicians, and the Extension Service. We owe much of the gains we've made to the helping hands these agencies gave us."

Results of a soil and range-condition survey of the Kalae Ranch, made by SCS technicians, showed that soils were acid, low in plant nutrients, high in titanium, and very erosive. Major plants on the ranch weren't much good for grazing and needed to be replaced to get maximum production. Factfinding data gathered from the survey formed the basis of a complete conservation and management program for the ranch.

The Extension Service and SCS advised Mendonca on the right kinds and amounts of grass seeds and fertilizers to use in laying down a good cover on the brushlands.

Robins started out by clearing and preparing for seeding about 200 acres of brushland the fall of 1952. A bulldozer was used to get rid of large and thick brush.

The area was disk tilled before drill seeding across the slope to Dallisgrass, alta fescue, white Dutch clover, and trefoil. A 3-inch rain hit the new seeding, cutting fields rather badly. Even so, in 4 months the seeding looked good and the soils were well-protected.

During 1953-55, another 600 acres of brushland were cleared, disk tilled, and sprig-planted to pangolagrass. In test plots, pangola had shown up well both in growth and palatability. It proved to be a good bet for brushland plantings.

Plantings of pangola and Big trefoil are still going on, and by 1958, Mendonca expects to have a total of a thousand acres improved and grazed under rotation.

Mendonca estimates the cost of clearing, preparing, and planting the thousand acre brushland area at around $60 per acre.

Heavy equipment used in the improvement work included a large crawler tractor with Fleko rake, a medium-sized crawler tractor, a wheeled farm tractor, heavy disk harrow, fertilizer spreader, drill, and a heavy-duty rotary mower.

Robins will tell you that one of the keys to improving brushland in this area is a first-class job of seedbed preparation. It's a must, he says, to remove all competition and allow for a good growth of desired forage.

Following tillage, Robins hand planted Pangola stolons or runners, in about every 4-foot square. He plowed small furrows across the slope in which the cuttings were planted. Generally, a man can sprig-plant three-fourths of an acre per day.

It takes about 6 months for pangola plantings to be ready for grazing. As soon as the ground is well-covered with runners, pangola gets off to a good start and makes top growth. A small

Gene Robins in a pangolagrass pasture.

handful of 16-20-0 fertilizer applied to each sprig at the time of plantings speeds up growth. And applications of 80 lbs. of nitrogen per acre has increased production as much as three times.

Putting a good grass cover on the old brushlands is only part of the overall ranch-development job. In 3 years, 15 miles of boundary- and rotation-pasture fencing have been put in, 8 miles of pipeline for stock water installed, two 10,000 gallon redwood stockwater tanks built, plus the application of 150 tons of mixed fertilizer.

All this ranch development work has paid off handsomely, says Mendonca.

He explains: "We figure we've got plenty of good forage for all of our stock now. Our rotation program of 15 days grazing followed by 30 to 45 days rest, produces high-quality feed. And with ample feed, we can now market beef in less than 2 years, instead of three as before."

Stubble Holds The Snow

Stubble Mulch and Windbreaks Prove Their Value During a Blizzard in Western Kansas.

By ROGER C. ARENSDORF

ONE of the worst blizzards of the past 50 years hit the southern Great Plains on Saturday, March 23, 1957. The blizzard was preceded by a light rain and a heavy, wet snowfall. Where the ground was covered with a good stubble or protected by windbreaks the snow was of inestimable value. But the snow that fell on bare fields served little purpose except to block highways, cover buildings, and cause great inconvenience to everyone.

The storm started with a gentle rain Friday afternoon. In the evening, rain changed to snow

Note:—The author is soil conservationist, Soil Conservation Service, Dodge City, Kans.

A farm shelterbelt collects drifts of snow.

with wet flakes as big as silver dollars. By midnight 6 inches of wet snow covered the land of Ford County. This was a "once in a lifetime" snowfall for southwestern Kansas.

The north wind arrived early Saturday morning with a fury that swept everything in its path. The snow, while wet and heavy, was not too heavy for this wind to blow away. The north sides of buildings were soon plastered with wet clinging snow that quickly froze to the walls. Gradually the bare fields were denuded of snow.

The wind continued to increase in velocity, until it drove the snow like a jet blast, reaching 60 miles per hour. Cattle began to drift, flounder, and die. High drifts began to form behind any type of wind protection—until some bit of cover caught and held it. In the areas of standing wheat and sorghum stubble the snow filled the fields to a level equal to the height of the standing stubble.

The storm moved out Sunday night.

Monday was a day of "digging out." All mechanized equipment was put to work to get city streets open and State highways cleared. High drifts made it slow going. Monday afternoon the main streets and roads were open to vital traffic. One-way traffic was possible on most main highways by Wednesday morning.

In the city, there seemed to be enough snow to later cause a flood. In the country it was different. The clean-tilled fields and those with sparce stubble were nearly bare. By Wednesday noon the sun and warm soil had melted most of the snow. Steam was rising from the warm black soil. The remaining snow was in an erratic

pattern. Leeward slopes still had snow. Depressions, such as natural drains, were snow filled. In the stubble fields and stubble-mulch fields there was wet slushy snow. The depth of snow remaining was in direct proportion to the vegetative cover.

A check showed a moisture depth of 6 to 12 inches in the bare fields. In the stubble-covered areas the moisture had penetrated 16 to 18 inches and still had another 2 inches of slush that would give a penetration of 24 to 28 inches.

Two inches of moisture can mean the difference between a profitable crop and crop failure in this area. The snow that was held by the stubble cover could be as vital to the next crop as was the windbreak protection given to cattle during the storm.

Winter moisture in this area is usually light. Snows are generally accompanied by high wind. This storm emphasized that stubble cover can be effective in catching the blowing snow. The snow that drifted into cities, farmsteads, and road ditches added nothing to crop yields.

Most stubble was sparce due to the drouth. Yet, many fields that were stubble-mulch tilled had enough cover to hold several inches of wet snow.

If stubble mulching were universally practiced there would not be drifts 10- to 20-feet high around buildings and in road cuts. It would not take 2 days to "dig out" after a blizzard of this type. Better crop yields and more money for farmers would result. Isn't it possible to keep more snow on the fields as an asset rather than let it drift into cities, roads, and farmsteads as a liability?

A good stubble mulch held most of the snow evenly on the land in spite of high winds.

Terraces and contour lister furrows held small amounts of snow, but high winds blew most of the record snowfall from this bare land.

Last winter there was little growing wheat due to the drouth. Dust storms were a constant threat. Only those fields with a protective stubble mulch as a method of wind-erosion control were immune. It is more effective than any other known practice.

Stubble mulch is doing many chores for Great Plains farmers. The stubble protects the fields from both wind and water erosion, catches the blowing snows, breaks up the force of raindrops during heavy rains, increases moisture infiltration, and reduces runoff.

This conservation practice is one that can more than carry its weight for the Great Plains. It is earning a place as the major conservation practice for most fields in the area.

SOUTH AFRICAN SOIL BANK.—The Union of South Africa's Department of Agriculture is starting a ley-cropping (pasture) scheme similar to the Soil Bank program of the United States. The main objectives are to check soil deterioration and cut down on cereal surpluses. The Union will pay a subsidy for the establishment of grass leys and will also make loans for farmers to buy livestock to eat the grass.

Group Action For Drainage

A Large Drainage Canal Is Constructed Through the Cooperation of More Than 90 South Carolina Farmers.

By J. B. EARLE

"GETTING this ditch was almost a miracle. We hardly thought it was possible," said Robert H. Moore, of Lake City, S. C. He was talking about a canal being dug to drain the Tupelo Bay Watershed in the Florence and Williamsburg Soil Conservation Districts.

He had reason to wonder if it could be done. It is the largest project of this kind that Soil Conservation Service technicians in South Carolina have surveyed and designed. It is the largest group drainage job in the State on which the Agricultural Conservation Program has agreed to share the costs through pooling agreements.

The canal is 7½ miles long and required the removal of 152,000 cubic yards of soil. There are 96 farmers in the watershed, which contains 10,600 acres of land. The right-of-way required the clearing of 75 acres of brush and timber.

To get this many people to cooperate and make the completion of the job possible was no small achievement.

Neighbors of J. B. Cook of Lake City heap most of the credit on him for the success of the project. "J. B. Cook spent days of his time without salary to get the job done. He arranged for rights-of-way and obtained the farmers' part of the cost," said Robert H. Moore.

Mr. Moore pointed out R. M. Ownes, SCS engineer, for praise and also emphasized that the ditch could not have been done without ACP cost-sharing.

Then too, Mr. Cook had a committee to help him. It was composed of S. E. Smith, S. C. Gray, Robert H. Moore, and Clarmon Stone, all of Lake City.

Mr. Cook said: "Cooperation was good or we couldn't have done it. I talked to 60 or more of the landowners individually from time to time to work out details. I was willing to spend time to get the canal because we needed it so badly. Everybody said it couldn't be done, but we wouldn't give up."

Why did he go to this much trouble? The answer is benefits—benefits to himself and his neighbors. "The ditch will be worth 10 times what it cost," he said. "Benefits after one big rain will equal what the canal cost. Somebody had to do it because you can't help yourself without helping others."

Moore, whose farm is located in the upper end of the watershed, far from an outlet without the canal, shares these views. He said: "My whole farm needed more drainage but I had no outlet. This was hurting me. Just a little too much water can very well cut tobacco yields $200 per acre. Very much water will completely ruin a crop of tobacco. Of all the things that can affect tobacco production adversely, drowning is the worst.

"I plan to cut a lateral ditch from my farm to the canal," Moore said. "This should give me good insurance against drowning of crops on my farm in the future." He also thinks the

Draglines digging drainage canal in the Tupelo Bay Watershed.

Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.

A section of the completed drainage canal in the Tupelo Bay Watershed.

dug canal will improve drainage in the natural runs. This will improve many farms too.

Then in typical young-farmer style, he said, "I can't understand why it hadn't been done years ago."

"The whole area has always been a mudhole," said S. B. McDaniel, whose farm is in the Florence County Soil Conservation District portion of the job.

"If it hadn't been for J. B. Cook the project would never have amounted to more than talk. He got things done," McDaniel said. Then he really warmed up with enthusiasm for the project and continued to talk about it. "After drainage the land won't be the same. This is the best thing that has happened to the community in the last 100 years. The land is already valuable, but this drainage ditch will make it much more valuable. There will be a large number of lateral ditches to extend the benefits to many landowners."

James E. Driskell, SCS technician at Kingstree, also thinks the land in this watershed is good. SCS soil maps show most of it to be class II-W and III-W. The soils are mostly of the Dunbar, Lynchburg, and Coxville series. "Dunbar is one of the best tobacco soils. Lynchburg is one of the best truck soils. But both need drainage," he said.

Then Driskell added, "This is one of the most needed drainage canals I have ever seen. I have been looking at this problem for 10 years and hoping the farmers would get together and solve it."

As to the lack of good drainage up to now, Albert H. Cole, SCS technician at Florence, had this to say, "Over the past several years we have made engineering surveys on the individual farms but no outlets were available. Therefore, these farmers could not drain their farms without a main canal to provide an outlet."

The time to dig drainage canals is when the ground is dry. It is cheaper this way. That is the way Dewey M. Cox of Lake City, a supervisor of the Williamsburg Soil Conservation District sees it. He practices this concept on his own farm and is prepared to cope with problems of too much or too little water. He was one of the first in the county to start irrigation. Also, he has done some tile drainage and plans to do some more. He had a part in the Tupelo Bay project too, as a supervisor of the district.

Cox said, "Farmers called me about the project regularly. Some liked the idea and some didn't. I realized there was a critical need for the canal. I contacted a number of farmers by telephone. They were very much interested. I think this type of group action to solve a common problem will spread. We are going to encourage that in this soil conservation district. I have already heard of interest in other communities. People in Long Branch Watershed in the Hebron-Barrineau crossroads community are aroused about it now. They are making plans for a similar-type project. We plan to help them all we can too."

Besides serving without salary as a supervisor of the Williamsburg Soil Conservation District, Mr. Cox is a former director of the farm bureau in the county and active in other community services and projects.

Grass Rebuilds Eroded Soil

By ROBERT T. SCHAFER

FRANCIS Brinker, Mitchell County, Kans. wheat farmer rebuilds soil fertility by growing Blackwell switchgrass. He claims he has doubled the organic content of worn out land in less than 5 years by grass farming and stubble mulching. Diverted acres are seeded to grass on the Brinker farm as wheat acreage decreases. The decrease in wheat acres, Brinker points out, is a result of wheat allotments and the Soil Bank Program.

The buildup of fertility has taken place mainly on land that formerly was difficult to cultivate because of serious erosion in past years. The erosion left a yellow colored clay subsoil exposed. Most of the area was cut up with sharp gullies that made cultivation almost impossible.

It was in this area that Brinker seeded his first 18 acres of Blackwell switchgrass in 1951. The seed came from the Soil Conservation Service cooperating with the Mitchell County Soil Conservation District. This grass seed was certified by the Kansas Crop Improvement Association and was intended primarily for seed-increase production.

Less than 40 pounds of seed were used on the 18 acres. The grass was seeded with sweet clover in 20-inch rows. No fertilizer was used at seeding time. Above normal rainfall in 1951 resulted in a heavy clover growth and it was not possible to determine that fall whether a stand of grass was to be obtained.

Early in 1952, it was discovered that a stand of switchgrass could develop if something were done with the enormous growth of second-year clover. The sweet clover was sprayed with 2-4-D when 8 inches high. Most of the clover was killed with no apparent damage to the grass.

Little research information was available at that time on the effect of commercial fertilizer on seed production of native warm-season grasses under field conditions. Brinker, during the 1940's, had used commercial fertilizer on winter wheat with outstanding results. Knowing that nitrogen would increase wheat production, he reasoned that seed production on his newly established stand of Blackwell switchgrass could also be increased. The first application, in the spring of 1952, was 500 pounds per acre of 20 percent ammonium sulphate, or 100 pounds of nitrogen.

The reserve of soil moisture stored during 1951 was enough to satisfactorily use this heavy application of nitrogen in 1952, and Brinker produced a 4,000 pound seed crop on the 18 acres. This was done on what appeared at that time to be a thin stand of Blackwell switchgrass. The first seed crop was sold for $1.50 per pound for the clean seed.

The first venture with native grass seed production seemed so profitable that approximately 100 acres more were seeded in 20-inch rows, in the spring of 1953, in sorghum stubble.

On the 18-acre field, 120 pounds of nitrogen were applied in 1953. Earlier soil tests had indicated that phosphorous was needed for maximum production. This was supplied in the form of rock phosphate at 1,000 pounds per acre.

Note:—The author is work unit conservationist, Soil Conservation Service, Beloit, Kans.

Francis Brinker (center) with Dean Haddock (left) and Robert T. Schafer inspect a field of Blackwell switchgrass on the Brinker Farm.

A drought had been in progress since the fall of 1951. There was not enough moisture to produce a good seed crop in 1953. Production for the year was approximately 100 pounds of clean seed.

In the spring of 1954, the 100 acres were reseeded on the contour in 40-inch rows. Dry weather and heat seemed, at first, to be more than the small seedlings could withstand. But during the growing season of 1954, it was discovered that two stands were developing on the 100-acre field. Grass seedlings that appeared to be dead in 1953 were alive. This is a fact well understood by grass specialists that are acquainted with the growth habits of native grasses.

A Seaman tiller was made into a 40-inch grass cultivator by Brinker in 1954. It was used successfully in cultivating the 18-acre field to take out every other row because the limited rainfall was not producing seed at the 20-inch row spacing. The same cultivator worked well in cultivating the 40-inch contoured rows on the 100-acre field.

In the spring of 1955, and again in 1956, the grass stands remained green, while wheat in nearby fields wilted and apparently died because of lack of moisture. Upon examination of the grass planting it was found that the mulch cover on the surface had reduced the loss of soil moisture. Thus, more water was available for use by the grass plants; furthermore, the thinner stand of grass required less moisture.

Upon further examination it was found that the soil structure and tilth had greatly improved during the 5 years. The formerly eroded subsoil had the characteristics of topsoil, rich in color, of good texture, and full of root residues. The change was so apparent that Brinker had a complete soil analysis made and found that the organic matter content had more than doubled in 5 year's time.

COUNTY APPROPRIATIONS.—Minnesota counties appropriated $29,660 for the use of soil conservation districts in 1957. Many favorable comments were made by county commissioners and county engineers about savings in the maintenance of roads and bridges as a result of soil conservation practices applied by district cooperators.

Minnesota Soil Conservation District News

Residues For The Soil

By MERVIN H. WALLACE

ESTIMATES indicate that more than 2 million tons of crop residues are being returned to the soil each year by Arizona farmers. This figure is based upon the 1956 crop acreage of the major residue producing crops; barley, grain sorghums, corn, and cotton. The residues from vegetables and minor crops as wheat, oats, and castorbeans, grown in limited amounts, were not considered.

At a Vocational Agriculture workshop, conducted by SCS technicians in June 1957, a farm south of Chandler was used as a laboratory for estimating crop residues and judging their value in a soil improvement program. A field of Ramona wheat, used to get the estimates, showed 8,350 pounds of stubble being returned to the soil. The farmer was applying 53 pounds of nitrogen to the residue as it was being turned under, preparatory to planting grain sorghum.

Note:—The author is management agronomist, Soil Conservation Service, Phoenix, Ariz.

Baked and cracked soil on irrigated land that lacks organic matter.

The physical condition of this field was very good.

This is only one example of an Arizona farm where a good program of crop residue management has been practiced for years, along with crop rotation and other good conservation practices. The benefits of this program are reflected in improvement of the physical condition of the soil and increased crop yields.

Burning or removal of crop residues was a common practice on Arizona farms as late as the midforties. Many farmers complained that

Mervin H. Wallace demonstrates method of estimating the amount of wheat residue to a group of Vocational Agriculture instructors.

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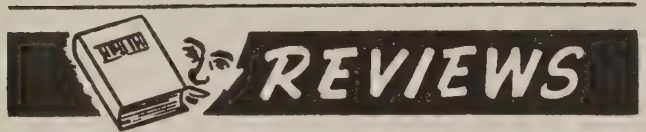
the residues interfered with plowing, seeding, cultivating, and irrigating, and when heavy residues were returned to the soil the following crop was "poisoned."

Modern machines, such as choppers, shredders, notched disks, and straw spreaders on the combines, have made it possible to chop up the residues so that they can be returned to the soil with little trouble.

The "poisoning", or nitrate tieup, which accompanies the decay of low nitrogen residues, is being offset by the use of commercial nitrogen. When the amount of residue is known, the farmers apply about 25 pounds of nitrogen per ton. A rule of thumb of 50 pounds actual nitrogen per acre is used for a fairly heavy crop of residue when an accurate volume estimate is not available.

Farmers are benefited in many ways by a good program of crop residue management. The benefits include: The improvement of soil structure, which in turn allows air and water to move more freely through the soil; less puddling and compaction by farm equipment; the addition of valuable plant nutrients which are released as the residues decay; and, the release of mineral nutrients already in the soil, due to the decay of the organic matter in the crop residues. Farmers report that they get more efficient use of water and fertilizer on soils well-supplied with organic matter.



MINERAL NUTRITION AND THE BALANCE OF LIFE. By Frank A. Gilbert. 350 pp. Illustrated. 1957. Norman: University of Oklahoma Press. $5.95.

THIS book is an expansion of an earlier work by the same author. The elements that are known to be essential to plants or animals are discussed. For each, there is a discussion of the role the element plays in plants and in animals, its distribution in soils, and symptoms of deficiency or toxicity in plants and animals, including man. There also are chapters on the more common toxic elements, and on human nutrition.

The scope is so broad that no single reviewer can assess the adequacy of the treatment of the various fields. It is obvious that the author is not a soil scientist, for some generally discredited ideas have been given the same treatment as those based on substantial evidence. The treatment of the functions of the elements in plants and of deficiency symptoms in plants is much better than the soil discussion. The bibliography contains about 1,200 references. This book will be useful to workers interested in the subject through its review of the diverse but related subject matters.

—GUY D. SMITH

CONCRETE-LINED DITCHES.—More than 40 miles of concrete-lined irrigation ditches and canals have been constructed in the Lower Virgin-Santa Clara Soil Conservation District of Utah during the past few years. Many other Utah districts also are using more and more concrete-lined ditches.

The concrete ditches are of especial value during years of short water supply because of the water saved from lack of seepage. The lined ditches have other advantages, too, because they give a more even distribution of water through the fields and hence permit better water management. Many Utah farmers are convinced that the cheapest water they get is that saved through the use of concrete-lined ditches.

—A. E. BEATY

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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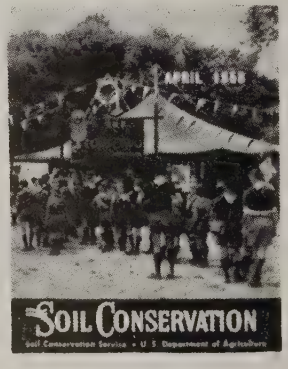
LAND JUDGING IN INDIANA.—In the fall of 1957, 146 teams competed in 9 district land judging contests in Indiana. Each county of the State was entitled to send 2 teams to one of these district contests. The top 25 percent of the teams competing in each district qualified to compete in the State contest, held on Oct. 19. Suitable trophies were presented to all winning teams and individuals in both the FFA and 4-H classes. Some of the high ranking teams will go to the National Contest in Oklahoma in May 1958.

THE NATIONAL LAND, PASTURE, AND RANGE JUDGING school and contest will be held again at Oklahoma City on May 1 and 2, 1958. The first day will be devoted to training, the second to contests.

There will be two contests, one for land and the other for pasture and range. Separate divisions for each contest will be set up for FFA and 4-H Clubs, adult men, women and girls, and college students.



FRONT COVER.—Boy Scouts troop into a tent to watch The Great Conservo perform conservation magic at the fourth National Scout Jamboree.

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Scouts Feature Soil Conservation

Boy Scout Troops All Over the Nation Concentrate on Soil- and Water-conservation Projects During April.

By TED S. PETTIT

MORE than a year's work of preparation and planning will reach a climax in April 1958, as the program of most of the 56,000 Scout troops of the country features activities in soil and water conservation. This is the month when the program theme is one phase of conservation. This year the emphasis is soil and water—not only soil and water in themselves, but also in relation to other renewable resources.

Planning for this theme started more than a year ago with the help of Agriculture's Soil Conservation Service and Forest Service, and Interior's Fish and Wildlife Service.

Planning was complicated because many Scouts live in urban or suburban areas where actual field observations and demonstrations are difficult, especially when scouting emphasizes "learning by doing." The Scout interpretation of the word "doing" goes beyond "looking and seeing." To Scouts, that word "do" means just that.

It is impossible to predict in advance the extent to which this program will be successful. Success is measured largely by the percentage of the more than a million Scouts who actually take part in a meaningful program of the "do" type of activities during April.

It is possible to predict that those troops that have the most successful programs will be the ones fortunate enough to have guidance and help from local SCS technicians, soil conservation district cooperators and supervisors, and other experienced local conservationists. Experience has shown that this help at the local level is an essential for a successful program.

Note:—The author is director of conservation, Boy Scouts of America, New Brunswick, N. J.

Most of the photographs used with this article were taken by William Hillcourt of the National Council, Boy Scouts of America.

Three program planning aids for scoutmasters have been distributed. First, is a Program Quarterly sent out in December from the national office of the Boy Scouts of America. Several pages in this publication outline ways that soil and water conservation may be included in regular troop programs for the month, with specifics for patrol meetings, patrol hikes, and troop hikes.

In January, two special booklets were sent to each Scout council office for distribution to troop leaders. One of the books, "Soil and Water Activities for Boy Scouts" was made available by the SCS and consists of 32 pages of specific, simple demonstration type and learn-by-doing type of activities. The second booklet, made available by The National Association of Soil Conservation Districts and the Frank Phillips Foundation, consists of 24 pages of troop and patrol projects—group projects that put into practice a few fundamental skills and techniques of soil and water conservation.

These three program aids emphasize things

Scouts building a rock dam across a gully in a Scout camp.

to do, with the "why" explanation for doing them kept at a minimum. The "why" of soil and water conservation is provided in a fourth publication available to any leader for 25 cents. The "Soil and Water Conservation Merit Badge Pamphlet" is available at any Scout office or Scout supply store.

Thus, each leader will know what to do and why, as he plans a program for his troop. But, he will need help in finding out how to do it and where.

It is hoped that SCS technicians and soil conservation district supervisors and others will offer their services to their local troops or Scout offices, and help local leaders plan the specifics of a program.

It is impossible for a national committee to pinpoint projects that are applicable everywhere in the country, and particularly to pinpoint specific places where these projects may be carried out.

As in any learning experience, conservation must be built on the personal background and experiences of the learners. Boys in Maine may not be impressed by stories of the Great Plains Dust Bowl, but they are impressed by soil erosion resulting from Maine forest fires, or by poor fishing resulting from pollution of Maine's rivers. Consequently, local help in program planning and operation is the key to the success of this program.

Following are some of the projects suggested for troops to undertake, starting in April and continuing as long as is practical. These are typical of many others that may be used, depending upon the local situation and the imagination and ingenuity of Scout leaders and professional conservationists.

Rural-Urban Exchange Visits:

To show city Scouts good examples of soil, water, range, woodlot, and wildlife conservation on farms and ranches; to show rural Scouts such things as water treatment, pollution control in the city, food processing and

Scouts learn about soils from SCS soil scientist.

Scouts get instruction on the conservation plan for the Scout camp grounds from SCS technician.

marketing, and natural history museums.

Outdoor Good Manners:

To teach fundamentals of good outdoor manners and good sportsmanship, and to promote better relations between sportsmen and landowners.

School Grounds Conservation Corner:

To do a good turn at school by working with teachers to develop an outdoor conservation laboratory for use by all classes in school. It is proposed that Scouts provide the manpower necessary to get this job done and to help collect those materials necessary to set up the conservation corner.

Backyard Conservation Projects:

To improve urban, suburban, and rural backyards through planting grass, shrubs, trees, flowers, and ornamentals; to carry out projects that attract more birds to backyards, and, in general, to do those things that make the entire community a more pleasant place to live. (Backyards may be interpreted as parks, roadsides, or similar areas.)

Conservation Trail:

To teach Scouts fundamentals of conservation while they carry out a community-service project. The proposal is that boys, under guidance, build a nature-conservation trail in a public park, school, churchground, edge of golf course, campground, or other suitable areas. The trail should interpret the natural history and conservation of the vicinity for any groups wanting to use it—garden clubs, school classes, conservation clubs, and Scouts.

Field Trips:

To visit points of conservation interest in or near the home community and with help of qualified guide, to see what conservation problems exist or have been overcome; or in the case of museums, to see instruction type exhibits that teach conservation fundamentals.

Land Judging:

To learn about soil and the many ways of conserving and using it properly. This project involves observation of good soil- and water-conservation practices, under guidance, followed by a land judging contest.

Erosion Control:

To control erosion and reduce soil losses on sand dunes, gullies, Scout camps, and high-

Scouts practice fighting forest fires.

way roadsides. This project involves planting grasses, shrubs, trees, or vines, and where necessary, fencing to protect the plantings. In Scout camps it might mean relocating trails so that they run on the contour.

Erosion Control Along Waterways:

To control erosion of eroding banks along streams, on shores of lakes and ponds, and on earthen dams; to prevent damage to farmland, silting of streams and reservoirs, and to improve conditions for wildlife and recreational facilities.

Trees for Conservation:

To develop skill in planting trees; to show the value of trees in controlling wind and water erosion for watershed protection; to learn the value of trees in providing shelter for livestock, schools, homes, and other buildings, playgrounds, and camping areas; to illustrate production of wood products and to provide food and shelter for wildlife.

Improve Land for Wildlife:

To show Scouts the needs of wildlife and what may be done to improve a given area of land so that more animals may be attracted to it.

Water for Wildlife:

To provide water for game birds and mammals and other wildlife, including fish.

Fire Protection:

To teach Scouts how to be careful with fire; how to put out small fires, and to use fire tools; to point up damage to watersheds, wildlife, and fish by grass or forest fires.

Miscellaneous Projects:

Other group projects suggested as possibilities include: Conservation exhibits, conservation field days, setting up a conservation library, conservation quiz contests, conservation skits for school assembly programs, conservation career guidance clinics, and conservation radio or TV programs with Scouts participating.

The scope of these projects is so broad, that any troop can select at least two or three that fit in with local conditions or needs regardless of where the troop meets—city, suburbs, small town, village, or rural area. But to carry them out to a successful conclusion, troops will need local guidance—guidance in selecting the best projects and help in finding places to work on these projects.

The potential in sound conservation education is great. The potential may be realized to the greatest degree, if troops get the help they need.

Scouts demonstrate the effects of vegetative cover on runoff and erosion.

SOIL BANK AND WILDLIFE.—One farm crop not in surplus should be increased by the Soil Bank. That crop is wildlife. Every soil bank acre should add something of food and cover for wild birds and mammals that inhabit farm land.

In the conservation reserve, soil bank acres may be used specifically to produce wildlife. At the soil-bank pay window, wildlife land commands exactly the same return in annual rental as grassland or woodland. In addition, farmers may harvest or sell their wildlife crop during the contract term, a privilege that does not apply to grass or trees under normal conditions.

—D. A. Williams, Administrator,
Soil Conservation Service

SOIL COMPACTION BY FARM MACHINERY

Prevention and Remedies

No. 32

This is the thirty-second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By M. L. NICHOLS

IN a recent issue of SOIL CONSERVATION the author pointed out some of the soil physical problems that have arisen as a result of the extensive mechanization of agriculture and something of the nature of soil reaction to the pressure of heavy equipment.

The injurious effects of compacting pressure are: Reduction of infiltration rate at the surface or decrease in permeability at lower levels, reduction of aeration, and, in some cases, mechanical restriction of root development. The avoidance or correction of such conditions, however, present a whole new series of technical problems of management and implement design, if we are not to lose the great advantages of modern production efficiency and decreased costs due to modern machinery.

The first and most important item of a program of correction of compaction ills is, whenever possible, prevention. As pointed out in the previous article, the farm operator must make sufficient study of his own soil to recognize critical conditions of moisture, not only at the surface, but at and immediately below plow depth, since moisture is usually the determing factor of compaction. It seems that in most cases the damage is done largely by occasional operations following too closely after wet spells, when farmers become alarmed by the lateness of the season or by the vigorous growth of weeds in cultivated crops.

One of the advantages of power farming is that the ability to get quickly over a large area enables an operator to wait until conditions improve. Under critical soil conditions, and with crops whose profit or loss depends on being ready for a short high-priced marketing period, adequate power and equipment is necessary to safely permit waiting. Under many conditions, the period of critical soil conditions can be materially reduced by surface and/or subsurface drainage to get rid of excess water quickly and extend the period of suitable tillage conditions in the soil.

The buildup of soil resistance to puddling by increasing organic matter with a grass or meadow crop is frequently a determining factor in safe management.

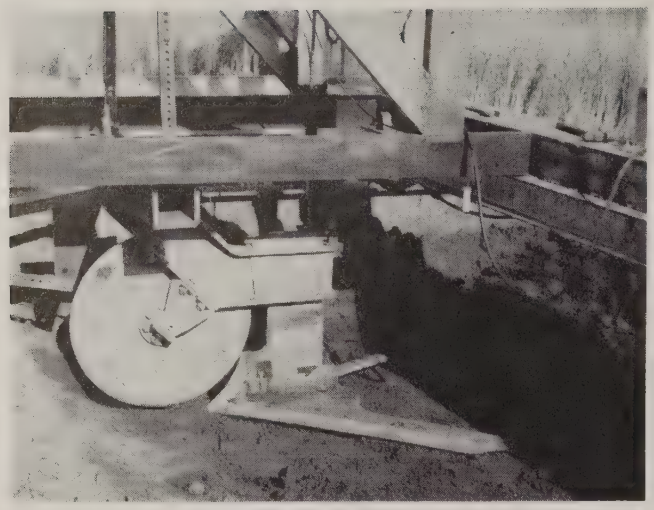
The idea of "minimum tillage" is a sound one, but this also depends on the judgment of the producer. In "minimum tillage" the ground may be plowed once and most of the soil preparation left to natural processes, such as wetting and drying, or freezing and thawing. The seed may be planted in some cases in the newly plowed soil and weed growth handled with preemergence and post-emergence sprays. Any practice such as cross dragging, which cultivates the crop and kills weeds with minimum traffic, may be beneficial.

It is doubtful, however, if harmful compaction can be completely avoided on some of our best soils under the pressures of modern equipment. Also, the avoidance of excessive packing does not help the farmer whose soil is already so dense as to adversely affect plant growth. All too frequently the damage has been done before the condition is realized. Then the problem becomes one of remedying an existing condition. Here we must depend on some form of subsoiling or subsurface tillage.

Subsoiling and deep tillage are old practices, but unfortunately we don't know enough about them to predict with certainty what results we should expect on different soils in

Note:—The author is director, National Tillage Machinery Laboratory, Agricultural Research Service, Auburn, Ala.

This is the second article written on this subject by the author. The first article appeared in the December 1957 issue of SOIL CONSERVATION.



A large sweep used for shattering plow soles.

various conditions without careful on-site examination and tests of implements under those conditions. There have been many tests of tillage equipment by soil and crop scientists and by engineers but, in many cases, these tests have consisted of pulling the implement through the soil and measuring yields afterwards. Since usually no definite evaluation of soil physical conditions was made, before or after tillage, there was no way of knowing what was done. In fact, we do not have good methods to evaluate the effects of tillage, so, to date, tillage remains more of an art than an exact science.

Subsoiling as generally practiced is a hit-and-miss affair. Most is done on the general premise that the soil needs loosening without much attention being given to the physical conditions of the subsoil at the time it is being tilled. In some cases, subsoiling produces visibly improved crops, which is sufficient evidence for most farmers to believe that where there is a real need and where the subsoiling is properly done the practice is profitable.

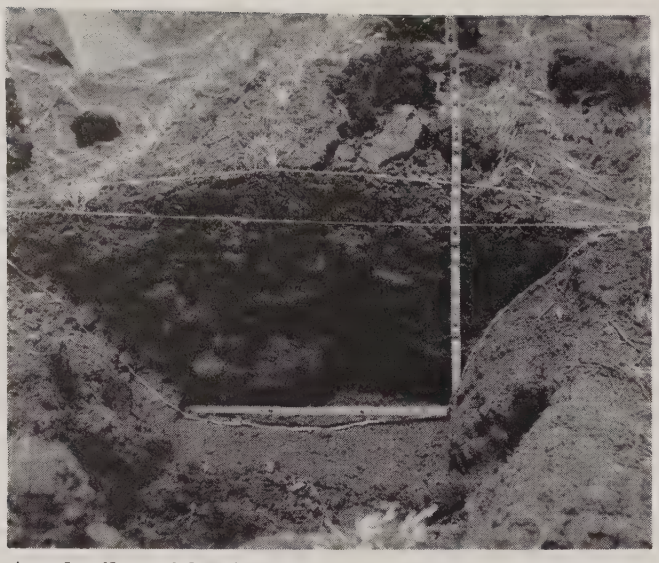
But subsoiling cannot take the place of rainfall or lack of fertility. At best, all it can do is to make better use of the available supply of moisture when this limitation is critical.

The problem is how to determine where conditions calling for subsoiling exist and how to alleviate them when found. That is the subject of a major research project at the National Tillage Machinery Laboratory.

The difficulty of the problem, from the practical standpoint, is that the farmer must determine what the soil conditions are under the surface and adjust his remedial measures from time to time in accordance with changing conditions.

It is not too difficult to examine subsurface conditions by digging in the tilled area for plow soles or other machine compaction and examine road cuts, or other exposures of the subsoil for natural dense layers. Simple tests of

When subsoiling is done with a large sweep the shattering may extend to the surface, as shown here. Furrow to left was made without a colter, the furrow on the right with a colter.



A subsoiler with wings extends the area of shattering.

permeability are beneficial in forming judgments of actual conditions in a field or area to be subsoiled. When it is determined that there are conditions which need improvement, the problem then is how to do it.

It should be remembered that conditions in the soil are constantly changing and that what may be a profitable expenditure under one set of physical conditions, may be largely a loss under other conditions. At the laboratory, we are determining the reaction of a number of soils in a wide range of conditions to various designs of subsoilers. The project is far from complete, so only a progress report can be given here.

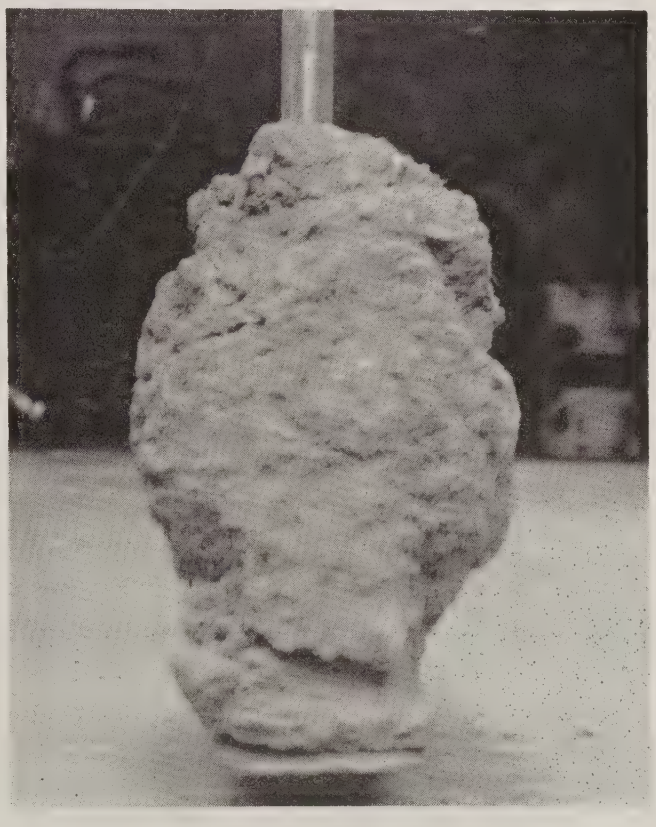
It appears from laboratory and field tests that the value of a subsoiling job depends upon shattering a layer, impervious or partly pervious to water, in such a fashion that it remains in this shattered or open condition long enough for roots to penetrate it and form channels to keep it open. Unfortunately, this depends upon subsequent climatic conditions suitable for rapid root growth.

Usually the subsoil tools will break out a path and shatter any hard pan. The cross section of this path is usually triangular, the rupture occurring at about 45° to the perpendicular. If the soil is sufficiently dry the shattering will go all the way down to the point of the subsoiler, which may be 16 to 24 inches deep. Frequently, however, due to moisture at greater depths, the triangular break does not extend to the depth of the subsoiler.

It requires greater power for deeper work; so, the question arises, does the extra power pay? It has been found at the National Tillage Machinery Laboratory that when soil is moist at the depth plowed we frequently get plastic flow around the subsoil point. Then the soil is simply pushed to one side or the other and compacted, leaving a channel like a mole drain. In some cases, this may persist for years.

In general, unless there is need for mole drainage, this type of soil reaction requires excessive power for the benefit received. Unless there is shattering to a depth near the subsoil point there is small benefit from this deep channeling. A subsoiler with "wings" attached to the point increases the cross section of shattering and requires little or no extra power.

The problem of what is happening at subsoiling depths with different soils and different designs of subsoilers is receiving careful study. First, it was found that the way the pressure is applied is important. If the subsoiler has a straight shank which pushes against the soil from the top to the bottom, the subsoiling re-



A subsoiler point running in moist, plastic soil may accumulate a cone of packed soil. This cone remained on the point for several hundred feet.

A curved shank on a subsoiler reduces draft.

quires greatly increased draft. This is due to the fact that the soil will break out an angle of about 45° due to horizontal pressure compacting the soil. If the pressure is directed more nearly upward, as is the case with a curved shank, there is a material reduction of draft with good shattering.

The method of applying shattering pressure by the use of sweeps on certain soil types is important. With large sweeps the pressure is almost completely from the bottom of the cut upward. The result is that the breaking fragmentation extends through a great part of the soil. The draft of such a sweep is high but it is very effective in shattering a large mass of soil.

A field strain gage dynamometer being used to measure draft on a subsoiler.

There have been suggested a number of means for correcting compaction, which are primarily directed towards tractor and implement design. It was known that the distribution of weight over a larger area reduced the pressure per unit of bearing area. This was, at first, thought to be the major item in preventing compaction. It was found, however, that at greater depth the total weight was the determining factor, and increasing the area of application with the same load did not decrease the packing in deeper layers.

When a tractor is used for light loads, if equipped with water-filled tires or detachable weights, these weights should be removed so as to reduce compaction. The use of tandem tires in experiments at Auburn indicates more efficient use of power and decreased slippage, which reduced compaction. Progress is being made in studies of alleviation of compact conditions on a wide front in the United States and Europe but the work is far from complete and much more attention should be given to this problem if permanent serious injury to some of our soils is to be avoided.

Conservation Irrigation Installed In Eight Months

By CARL E. FOX

IT took just 8 months, from the time Donald Sampson, farm manager for the Maude Ross Farms, signed a cooperative agreement with the Merrick County Soil Conservation District until conservation irrigation was established on the entire farm.

Walter Garrett, operator of this 120-acre unit, north of Central City, Nebr., says, "It was quite a facelifting this farm got."

Note:—The author is work unit conservationist, Soil Conservation Service, St. Paul, Nebr.

Walter Garrett (left), and Donald Sampson discuss the installation of an irrigation flume.

The west eighty hadn't produced enough to pay its way for quite awhile. Carl Fox and Herb Casey, of the Soil Conservation Service, made a topographic survey of the farm during the winter on one of those days when the rodman had to step lively to keep warm. It was easy to see from the "topog" that a lot of work would have to be done.

The next spring the soil scientists of SCS made a soil survey of the farm. The next step was to develop a conservation and irrigation plan for the entire unit. Fox assisted Sampson and Garrett develop a plan to provide for the best land use and management of the soil and water on the farm. This hummocky and poorly drained farm took on a new look as the contractor's earth movers began hauling the 28,376 cubic yards of earth to where it was needed. Three different row directions were used to take advantage of the natural slopes and provide for the best drainage.

One field was leveled on three different planes. Known as field benching, it was done to take advantage of a natural ridge and to remove as little topsoil as possible.

One 21-acre field was so flat that grade had to be built to get enough slope for irrigation and drainage. This field was leveled to a grade of .1 foot drop per 100 feet. On an average the fields have between a .2 to .3 foot drop per 100 feet. As Sampson remarked, "There is no doubt about it, land leveling is necessary for good water management."

The 8 irrigation structures installed on the farm, by another contractor, are big factors in the water-management system for this farm. Lateral grades were kept flat between drop structures. All other laterals were layed out on .05 foot drop per 100 feet. This permits using only one check dam per irrigation set, as well as keeping all waterflow well below erosive velocities. Over 8,000 feet of laterals are used to carry the irrigation water where it is needed.

Two flumes were installed to carry water across open drains. One is made of heavy gauge 18-inch spiral welded, smooth steel pipe, and the other of 24-inch corrugated metal pipe. Both have reinforced concrete entrance and outlet structures. One flume outlet is provided with delivery at 2 different elevations. One of the 5 drop structures is a combination drop and water turn structure. This provides an easy way to change the direction of flow in the lateral.

More than 6,000 feet of open drains were constructed to remove excess surface water due to rain. Good drainage was one of the major conservation needs on this farm, so care was taken to see that all fields had proper drainage.

All in all, the "facelifting" this farm received should be a profitable one for years to come, because "facelifting" in this case means conservation, irrigation, and better water management.

The difference in elevation of a lateral and open drain on the Maude Ross Farm is shown by the position of the two men.

Soil Surveyors At Work

By J. J. FOLKS, FRANK VIERA, and
BERNHARD A. ROTH

HAVE you ever hiked a trail-ridge where it was possible to look down both sides of a mountain range? On one side there may be a river valley with all its irrigated farms, on the other side rolling plains, with farm or ranch homes miles apart. I have hiked this kind of country. I am a soil scientist engaged in making soil surveys.

It is a wonderful career if you love the outdoors. On any one day you may come face to face with deer, antelope, elk, wild turkey, or even bear. It all depends on the type of country you are working in. I live and work in the mountains of the West and love it. I like to fish the swift mountain streams for trout, or just camp by the side of a mountain lake. My job gives me the opportunity to know the country and where the best fishing streams and hunting grounds are.

Being a soil scientist is not all fun, but even the hard work offers rewards. There is a deep satisfaction in being able to help some farmer or rancher with his soil problems. Many times these problems are a real challenge.

Why do trees in an orchard turn yellow? Why does the corn grow green and tall on one soil and is stunted and yellow on another? Why does one dam hold water and another leak or wash out? Soil that we see and walk on every day seems so simple until we begin to really study it, and then we find it very complex.

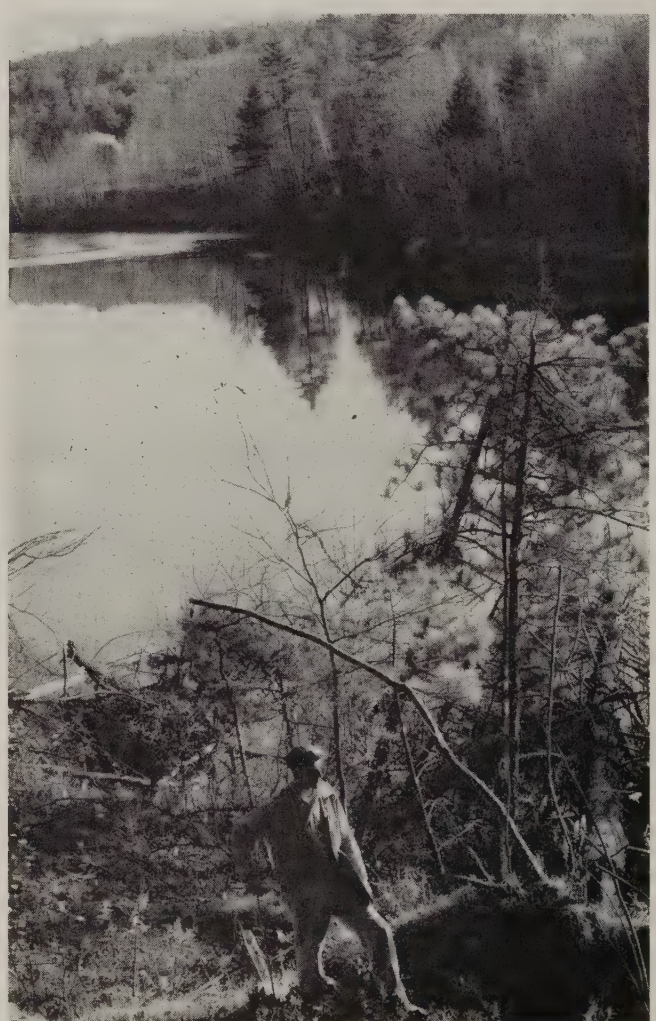
As a soil scientist one trys to find out how one soil differs from another and what causes it to differ. These differences are then outlined on a map and described in writing.

You will have to face the cold, the heat, snow, and rain. There will be mosquitos, ticks, and snakes; but, one who enjoys outdoor life has prepared himself to combat such hazards.

In soil survey work you meet all kinds of people of every race, color, and creed.

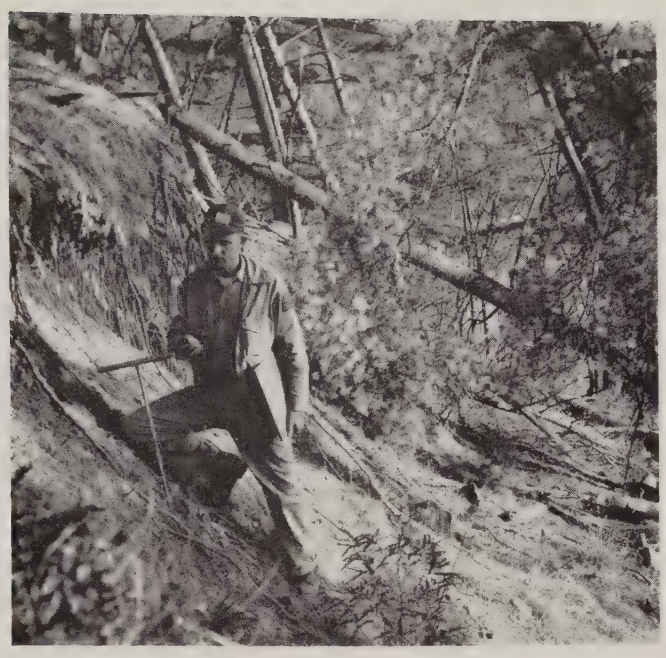
You especially come in contact with some "Old Timers" still farming or ranching the same piece of land where they were born. To me, there is nothing more interesting than to hear them describe the country as they knew it when they were boys. You can actually see the changes for better or worse as they describe them.

The life of a soil scientist is interesting and exciting and the satisfaction for a job well done compensates for the inconveniences.



Its a wonderful career if you like the outdoors.

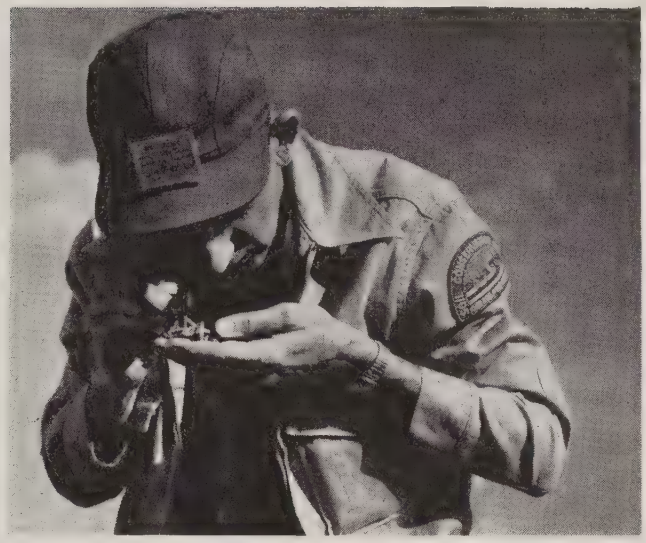
Note:—The text is written by J. J. Folks, soil scientist, Santa Fe, N. Mex.; the action is portrayed by Frank Viera, soil scientist, Laconia, N. H.; the photography is by Bernhard A. Roth, information specialist, Upper Darby, Pa.; all are with the Soil Conservation Service.



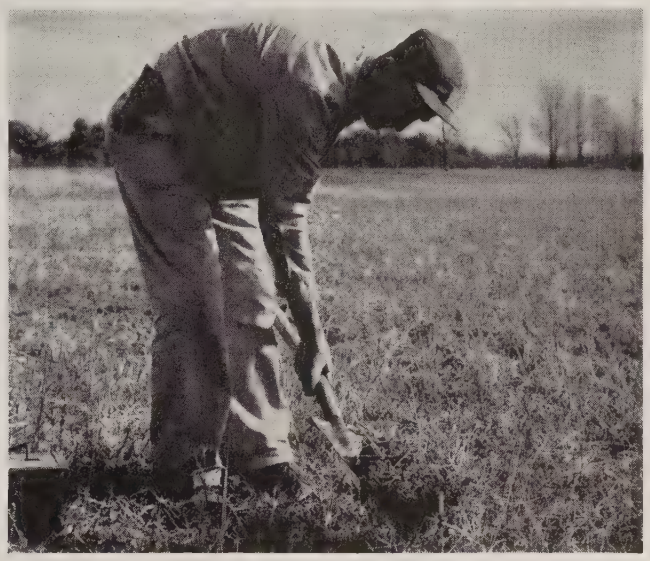
A soil survey is needed in wilderness areas as well as on farmland.

You may find severe erosion, such as this washed-out logging trail.

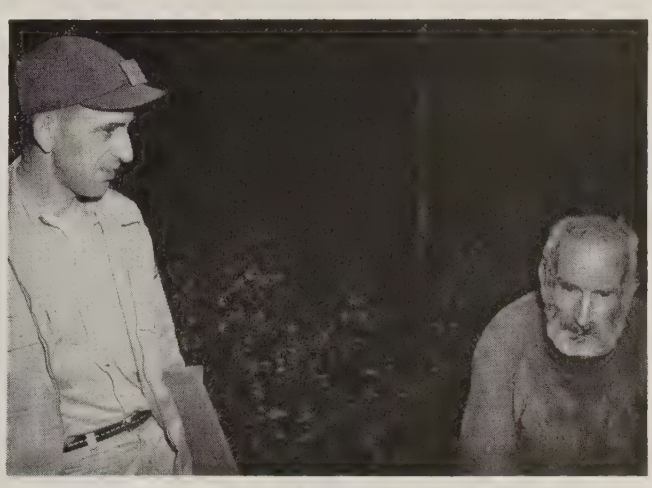
Probing the muck of a marsh may be a safety precaution as well as a means of determining soil facts.



Microscopic examinations are sometimes necessary to determine soil structure.



A strong back is a good asset for a soil surveyor.



You may meet some "Old Timers" who give you interesting information.

Extra Profits From Wildlife

Farmers and Ranchers on the Texas Gulf Coast Obtain a Substantial Income From Hunting and Fishing Rights on Their Ricefields and Ranges.

By HASKELL T. MICHAEL

THE Trinity Bay Soil Conservation District on the gulf coast of southeastern Texas is the wintering ground for millions of ducks and geese. They come from both the central and Mississippi flyways. There is an abundance of muskrat for fur and excellent fresh and salt water fishing. Add to this a prosperous agriculture of rice farming, livestock production on improved pastures, native and salt marsh range, and you have all the ingredients necessary for a sportsman's paradise, IF . . .

The big "IF" depends upon Man. Wildlife occupies land bestowed by Nature. This makes game managers out of farmers and ranchers whether they realize it or not, and those who are managing wildlife as a part of their farming enterprise are providing the answer.

J. S. (Skeet) Kole has a 425-acre reservoir on his 2,019-acre rice farm. The farm and reservoir border the salt marsh where ducks and geese spend the winter. The birds depend on the reservoir for a resting area and fresh drinking water. Mr. Kole leases the reservoir to hunting and fishing clubs each year. The club members keep to the rules that will provide good hunting yet will allow the birds to have definite protection from hunting periods. Hunters limit themselves to half-day hunting leaving the reservoir to the birds during the afternoon.

Kole says anyone can gross $10 per acre per year on similar projects. Some people report gross incomes as high as $25 per acre. "However," Skeet hastens to add, "that's not all profit." He, like others, has a big investment in his land and reservoir—water must be pumped and levees maintained.

Having the birds so close to his fields creates a problem. The ducks and geese are heavy users of rice grain, clover, and grass. This makes for fat ducks and happy hunters, but it hits Mr. Kole in the pocketbook. He isn't hit as hard as those who lose their rice and grass, yet receive no compensation because they haven't managed their wildlife wisely.

Note:—The author is work unit conservationist, Soil Conservation Service, Anahuac, Tex.

Ducks feeding on flooded rice field in the Trinity Bay Soil Conservation District.

Cattle walkway on the Jamie White Ranch.

After the hunting season, the Kole reservoir is leased to fishermen on a seasonal basis. Their regulations meet, or exceed, those set up by the State Game, Fish, and Oyster Commission. This results in many happy days of excellent bass, bream, and cat fishing.

Jamie White has used a new, unique way to collect an extra premium on his land. He leased about 6,000 acres of his salt marsh rangeland to the Sprig Ridge Hunting, Fishing, and Recreational Club for 5 years, plus a 5-year option. Highlights of the contract are:

1. All wildlife management will be in accord with a conservation plan prepared by Mr. White and the Trinity Bay Soil Conservation District.
2. Certain permanent-improvement measures, such as water-level control structures and cattle walkways and crossings, will be installed by the club as part of the contract.
3. Mr. White's cattle will have unrestricted access to the leased area for grazing purposes.

Results are that besides getting lease money, Mr. White will have better grazing because of the walkways and water-control structures, better control over wildlife, and he can manage his range to increase the more desirable forage plants for both livestock and wildlife.

He also has the satisfaction of knowing that his land is helping to conserve some of our natural resources. Mr. White is a long-time cooperator with his soil conservation district.

The "city cousins" will rejoice each year, too. They will be enjoying some of the best hunting on the gulf coast. Conservation management causes abundant production of native plants such as Olney bulrush, barnyard grasses, and widgeongrass for waterfowl food—that's what attracts the ducks and geese and keeps them there.

Many rice farmers in the gulf coast area are realizing 25¢ to 50¢ per acre by leasing their land to clubs or individuals after harvest season. Others manage their land differently and charge from $4 to $10 per day to hunt on a day to day basis. When water is available, they like to flood the rice fields to attract ducks. The flooding also makes it possible for the ducks to eat the shattered rice and many other seeds they can't pick up from dry ground.

One of the largest day-lease operations on the gulf coast is the Ralph J. Barrow Ranch south of Anahuac. This 19,693-acre ranch has had as many as 600 hunters in one day and 5,000 hunters in one season. Admission is $5.00 per day for duck and goose hunting privileges. The ranch is widely known for its hunting excellence, as demonstrated by a harvest of 18,000 ducks and 5,200 geese in the 1952-53 season.

In one particularly good year, 1938, over 74,000 muskats were trapped on the ranch.

Wildlife utilization has been an asset to Mr. Barrow, but he has had to provide management and capital to conserve and improve it for future hunters' enjoyment.

As a part of his management plan Mr. Barrow has constructed about 10 miles of cattle walkways in the marshland portion of the ranch. Their principle purpose is to provide even grazing distribution by the livestock. However, they help hunters to scatter out more,

and they look mighty good to a lost hunter trying to find his way out of the marsh.

Regular farming activities of the Barrow Ranch are cattle and rice production. The wisely managed wildlife supplements the ranch income and provides recreation to the hundreds of city dwellers who otherwise might have no place to hunt.

Not all rice farmers like to have hunters on their farms. They prefer keeping the land dry and grazing the green rice leaves and straw following harvest. Some have had cattle shot by careless hunters and they now police their fields closely.

These fields, naturally, provide an excellent refuge for geese because they can pick up the waste rice from dry ground while being protected by the landowners.

Other farmers charge from $3 to $5 per day for goose hunting in the rice fields. These are usually the ones who have fewer cattle or enough improved pasture for their cattle without grazing the ricefields.

These conservation-minded landowners enjoy the good hunting and fishing, improve their wildlife habitat, provide city people with recreation, and make some money. They are proving what any conservationist, whether practicing or professional, will tell you—conservation doesn't cost, it pays!

TAKING WATER UPHILL.—Clyde Leonard of Bernardstown, Mass., needed a farm pond. He had a good pond site, but the site was on a small plateau about 20 feet above the small stream that was to feed it. He called on SCS technicians to help him solve the problem. A diversion ditch was started 800 feet upstream. The ditch tapped the stream and diverted water into a natural watercourse that led to the pond site. Leonard is quite proud of the filled pond.

—Ed Konieczny

SOIL DEPLETION IN SOUTH AFRICA.—It is unfortunately true that with the passage of time our soils have lost their inherent fertility to such an extent that in spite of great progress in technology the yields per unit compare unfavorably with those of other countries with which we have to compete. This condition is particularly noticeable in the Eastern Highveld of the Orange Free State and Transvaal.

—*Farming in South Africa*

Better Marshes

A Soil Conservationist Helps Create More and Better Marshes for Wildlife.

By LESTER FOX

WHEN Rodger Beadle talks to farmers, they listen. They know he practices his own preaching.

Beadle is a technician in charge of the Soil Conservation Service office in Newport, Vt. He spends his vacations trapping on his 15 acres of marshland and along 2 miles of the Barton River a few miles from his Newport Center home.

Note:—The author is an information specialist, Soil Conservation Service, Upper Darby, Pa.

Alice Kinghorn models a muskrat coat on a TV program about marsh development.

Roger Beadle running trap line in a marsh he created by dynamiting canals to bring excess water from another nearby marsh.

Beadle gets most of his Christmas money by trapping fur bearers on the marshes he has developed. He has shown by example that other Northeastern farmers could pick up an extra $150 to $300 a year by developing their marshes.

In 10 days, Beadle trapped 176 muskrats, a mink, and a raccoon. He got $150.78 for these. In the previous winter he trapped 7 beavers in 2 weeks. They brought $84. Year's take: $234.78. The 1957 fur market was sluggish, Beadle said.

As Beadle says, marsh work comes in the fall when it doesn't conflict with pressing farm jobs. Whatever it produces, he feels, is so much for the piggy bank.

Roger Beadle once owned the 175-acre farm where the marshes are. His dad handed it down to him. In 1955, he sold the farm to his neighbor who wanted to enlarge his holdings, but Rodger retained the hunting and trapping rights. He started his marsh development work 6 years ago when he became a cooperator with the Orleans County Soil Conservation District.

One of the first things Beadle did was to make more marshland. He had lots of water but most of it was running into the river. So, to conserve the water, he blasted canals to spread it out over a larger area. That provided more room for muskrats and beavers. As cattails spread, the muskrats had more food. He canoes to his traps over his manmade canals.

This conservationist planted borders to provide shelter and food for ruffed grouse and other birds. He has set out wild cranberry, tatarian honeysuckle, and multiflora rose. He has planted basket willow shrubs to keep the river banks from sloughing off. He plans to put in earth dikes to raise and keep the water level more constant.

"Water's the big factor in making profitable use of marshland," Beadle says. "More water means more wildlife food and more room for the animals to move around in. They can protect themselves better against their enemies. They have room and food enough to multiply.

"The way it is now, when spring floods come, most of the water rushes off into the river. That's why I'm putting in dikes. I want to hold that water and put it to use."

Beadle sets out 150 steel traps. They cost around $9 a dozen. He spent $25 for dynamite

to blast 250 feet of ditches; creating another marsh by the spreading around of water. And, he put $190 into an aluminum canoe that lets him glide across the marshes and up and down the river in checking his traps. "Not every farmer would need a canoe," Beadle points out.

He regulates his muskrat harvest to keep the animal population in balance. "Overtrapping cuts the source of supply," he says. "On the other hand, undertrapping lets the rat population get too big for the food supply and marsh habitat. Overpopulation means animal disease and damage."

Before he starts harvesting his fur crop, Beadle counts the muskrat houses, and harvests only one or two rats per house. He changes his traps around in his four marshes, the way cattlemen rotate their pastures. In carrying out his marshland conservation, he works closely with the State Fish and Game Service.

Beadle has seen his marshland conservation work increase the muskrat and beaver population. Native ducks have gained in numbers too, and grouse are on the increase.

Beadle has found his marsh work a lot of fun. "It's good sport," he says.

Trash Farming Pays

Stubble Mulch Summer Fallow Increases Wheat Yields While Preventing Wind Erosion and Supporting a Cattle Enterprise for a Wyoming Farmer.

By W. L. VAUGHT

C. W. REED, commonly known as "Charlie", is a long-time resident of northern Campbell County, Wyo., having homesteaded near Recluse in 1911.

I drove into the Reed Farm the other day to talk with Charlie about his stubble-mulch farming, which he calls "trash farming." It was natural for me to stop to see him because he has been a cooperator of the Intermountain Soil Conservation District for several years. In fact, his nephew, Louis Reed, Jr., is the chairman of the board of supervisors and is a trash farmer himself.

I found Charlie and his hired man busy building a cross fence through a native pasture he had pitted last year. He wasn't too busy to talk, in fact, he was anxious to explain about his new era in wheat farming. So, the fencing project stopped for the rest of the morning.

I learned that his summer fallow operation on 400 acres of wheatland and his livestock operations are inseparable.

Charlie Reed, during his 46 years of farming, has had time to learn nearly all there is to know about dryland wheat farming. He says that 1911, the year he homesteaded, was the driest of all the years he has been on his ranch. Alternate wet and dry years have followed each other with relentless monotony during this time. He expects this to continue for years to come.

Through his many years of farming, Charlie had earned the reputation of being the "cleanest" farmer in the county. He never allowed weeds to grow in his summer fallow, and he was very proud of his reputation. During the many dry years, however, his heart was heavy with the knowledge that his farm wouldn't last forever the way the topsoil was disappearing when the wind blew.

When he went south for a visit, a few years ago, he became acquainted with farmers from Canada and Montana who were visting the same area. It was natural for wheat farmers to talk farming operations. Charlie, being a good listener, perked up his ears when he heard them discussing a completely new term to him called "trash farming", and asked for an explanation. Their answer stirred Charlie, though he did nothing about it at that time.

His harvesting has been done by the same custom combine operator for several years, and soon the term "trash farming" came up during their many "talkfests." The combine operator remarked that practically all the wheat he harvested in Montana was on stubble mulched land.

Note:—The author is area conservationist, Soil Conservation Service, Gillette, Wyo.

Charlie Reed in wheat stubble that has been tilled once with a 9-foot straight blade subsurface tiller.

This was enough for Charlie. He was determined that he was going to tie down his topsoil. He knew he could raise a good crop if he could only hold down his soil.

Three years ago he purchased a stubble-mulch cultivator with a 10-foot V-type blade and a 9-foot straight blade. The first thing he did was to push his moldboard plow out of the way. Charlie told me that the "beast" (meaning the plow) was for sale CHEAP. He did say however, he would hate to push the "durn" thing off on his worst enemy. Anyway, HE is finished with it.

Three years have gone by since he bought the cultivator, and Charlie is so enthusiastic about his success that he wishes he could start all over again.

He bought a screw type soil auger too, and has it nearly worn out. He bores holes in stubble-mulch fields and bare-fallow fields, to make certain of what is happening, moisture-wise. Charlie wasn't a bit timid in telling what he has found with his auger either!

In early June, last year, he found moisture through 48 inches on his trash fields, while across the fence on bare fallow he found only 24 inches. Just talk to Charlie a few minutes and you know he's convinced!

Stubble-mulch farming is important in his livestock operations. Charlie buys calves in the fall and keeps them until May or June. He showed me how he gets the volunteer wheat to sprout (with the cultivation), and how it does grow! Charlie turns his calves loose on it, and it's needless to say how they do. They do equally well in the spring, and he told me he sold them in June of last year at an average of slightly over 600 pounds.

I began to wonder about the wisdom of this, thinking the wheatfield would be sapped of all its moisture. Charlie told me that the soil had to dry up on the top anyway and the volunteer wheat took practically all its moisture from the top 4 to 6 inches.

We finally got down to the actual operations that he carried out, and as simple as it is, it adds up to the realization of Charlie's dreams.

Each summer he follows up the combine immediately with the 9-foot straight blade going 6 to 8 inches deep. The drier the soil the better results he gets. To a stranger, the field would look untouched. Actually all the stubble has been undercut, most of the weeds killed, and yet the stubble is standing erect.

Reed demonstrates the depth of protective mulch on one of his fields.

This operation actually makes a seedbed for the volunteer wheat, which sprouts immediately into a good stand. The stubble stands erect all winter, filling with snow. In the late spring, when the top 4 inches have dried out, the 10 foot V-type blade is used to kill the remaining volunteer wheat, cheatgrass, and other weeds. This is done once or twice before seeding the wheat in the fall.

Charlie says, "There are some headaches that accompany the stubble mulching method! His biggest problem is getting rid of the cheatgrass. The weather is a definite factor in the success of this type of summer fallow because the sun must be hot enough to kill the weeds and cheatgrass once the roots are brought to the surface.

He explained how he thinks he has this whipped, but is withholding judgment until he tries it one more season. He pulls a coil-type harrow right behind the sweep, which shatters the clods clinging to the cheatgrass roots. This tends to expose the roots to the hot sun which results in a much higher percentage of kill.

In 3 years he has conditioned his fields to the point that at no time during the year is any soil exposed to the winds. He says he has eliminated 90 percent of his soil loss. This fills Charlie with a great deal of satisfaction and pride.

Charlie estimates that he does his summer fallow operations 25 percent cheaper than by moldboarding. In this age of short margins, that 25 percent saving may mean the difference between profit and loss.

After enjoying a hearty ranch meal with Charlie, and upon leaving, he said to me, "I have the trashiest farm in the country, and some of my neighbors think I'm crazy, but do you want to buy a moldboard plow? It's for sale cheap!"

GRASS SEED EXPORTS.—From July 1 through November 1957, U. S. exports of grass and legume seeds totaled 14,656,000 pounds, compared with 12,308,000 pounds for the same period in 1956. A record shipment of 3 million pounds of alfalfa seed to the Federal Republic of Germany accounted for most of the increase.

Trees Stop Blowouts

A Vermont Farmer Stops Wind Erosion and Builds Up Solid Capital for His Heirs by Planting Trees.

By LESTER FOX

FRANK G. WESTALL is a prudent Vermont farmer. His prudence led him to a decision to change his will in an unusual and important respect. He asked his lawer to insert a clause that would restrict his heirs and assigns to selective tree cutting on the woodland of his Richmond, Vt. dairy farm in the Winooski Soil Conservation District. This will make his woodlands be productive indefinitely.

Westall has a deep respect for trees. But for them, the chances are that he wouldn't have much of a farm today. Wind would have blown away much of it from his sloping fields.

The land was in pretty good condition when Frank's father, the late Henry Westall, acquired the 500-acre farm in 1914. There were signs even then, though, of bad times ahead.

Some of the hillsides had been stripped of trees to make room for pastures and row crops. Slopes were often so steep that the land would have been better off if it had been left in trees. Following the farming pattern of the times, Henry Westall continued to overgraze the thinning hillside pastures. Bare spots appeared here and there, but they weren't recognized as danger signals in those days.

The naked spots got bigger and bigger and the grass sod became thinner and weaker. The wind was cutting into the Adams loamy fine sand that made up most of the soil in the sloping pastures. By 1938, conditions on the Westall farm had become critical. The same was true of other farms in the area.

One 14-acre expanse on the Westall farm had already been wind-churned into a crater of

Note:—The author is an information specialist, Soil Conservation Service, Upper Darby, Pa.

sterile sand. A 6-acre patch was in the same condition. Smaller "blowouts", as these windswept scars were called, pot-marked the farm. Worst of all, sand was piling up in dunes along the edges of the blowouts, ready to be swept along by the next breeze. The blow areas were spreading like cancers, eating away at the farm with a glutton's appetite.

Little wonder that Henry Westall offered his windswept farm as a guinea pig when the Soil Conservation Service set up demonstration projects to show what conservation treatment could do.

SCS technicians started work on the place in 1938. They first made a soils map. This showed the kinds of soil that made up the farm, and showed the best and safest use that could be made of each soil type. The technicians used the soils map to help the Westalls prepare a long-range conservation plan for the entire farm.

The blowout areas and steep pastures ready to blow had to be reforested. Workers planted trees on 60 acres. Then, they had to fence the areas to keep grazing animals out. That took 6,600 feet of fencing. Workers then had to pile brush 3 to 4 feet high in fence rows to soften the wind's blows. The brush fences crisscrossed the blow areas. Most of them were at right angles to the direction of prevailing winds. The workers set them 200 feet apart. But for these barriers, the wind would have blown the seedling trees out as fast as workers put them in. The protective brush fences gave the seedlings a chance to take root.

Some areas were so bad that the brush fences alone could not provide enough protection. There the workers planted fast-growing grasses to give the baby trees more protection.

That first year the Westalls planted 94,800 trees. Species included red, pitch, and Scotch pine, spruce, European larch, and black locust. The Westalls planted the trees 3 to 6 feet apart —spacing depending on the species and need for cover.

Other Vermont farmers took their cue from the Westalls. They stopped wind erosion on their farms in the same way.

Frank Westall hasn't yet reaped too many benefits that he can put in the bank. He credits the wind erosion control job, though, with saving his uplands and keeping his farm intact. But, with continued conservation management, the woodlands will, one of these days, start

A large blow area on the Westall Farm soon after crisscross brush fences had been built in 1938 to check blowing while seedling trees were getting started.

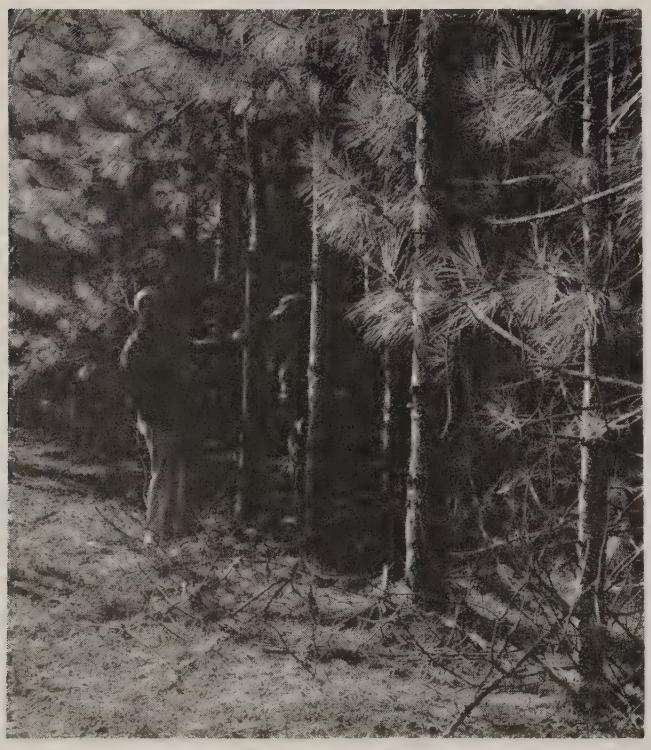
adding to the farm's income. That's why Frank wants his heirs protected by that clause in his will.

"In the past 2 or 3 winters I've pruned 25 or 30 acres of the plantation," Westall said. I'll continue doing this each winter. I use my regular farm help. Keeping them busy in the winter gives me a better all-year crew.

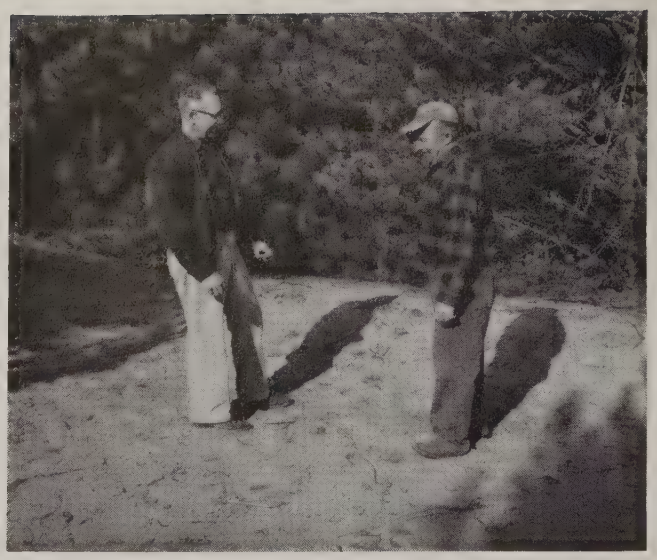
"I prune only the trees that will produce valuable sawlogs. The rest I'm thinning out as pulpwood. I may make a little money from thinning and culling but I'd do it anyway. It makes the remaining trees worth so much more. In time I'll prune the good trees to a height of 17 feet. That'll give me 16-foot sawlogs without knots. The knotless logs will bring top prices, about double those with knots."

In his thinning work, Westall has the help of George W. C. Turner, county forester. He figures to net $6 to $10 an acre, the first direct income from the plantation that put an end to the "sand blows."

Though only 39, Frank Westall doesn't expect to reap big financial benefits from his sand-blow plantations. His children will do that, for it will be another 30 to 50 years before the plantations reach peak production. So



A 20-year old planting of red pines on the Westall farm.



Frank Westall (right), and SCS technician Robert Towne stand in one of the few bare, sandy spots on the Westall farm.

Mr. and Mrs. Westall will pass on the main financial benefits to their 3 girls and 2 boys. Their children range in age from 9 to 14 years.

Meantime, Mr. and Mrs. Westall are enjoying other benefits of their work. "We can't overrate the beauty of our woodlands," Frank emphasized. "The tree planting not only saved our uplands and increased the value of our farm; it has turned barren stretches of desert into a beautiful green forest. It has put an end to the restless blowng of sand over our pastures. It has stopped the drifting of dunes that used to pile up 6 feet high."

Westall's bankrupt sand blows have been turned into a solid bank account. The trees are his "principal" and each year's growth is "compound interest."

YANKEE PRUDENCE.—Like many another area, Martha's Vineyard had a bone-dry summer in 1957. Most of the farmers faced a hay-short winter. But they didn't sit around wringing their hands. All Dukes County Soil Conservation District cooperators, the farmers pooled their hay orders. Then, through their district, they went to the Authority that operates the ferry service to the mainland. With their pooled orders, they had enough tonnage to get a shipping rate of 23 cents a hundredweight. The usual rate is 38 cents.

—Ezra Shaw

DISTRICT PROFILE

JOHN ED CHAMBERS of ARKANSAS

JOHN ED CHAMBERS, newly elected president of the Arkansas Association of Soil Conservation Districts, is a dedicated conservationist.

In addition to serving as president of the Danville State Bank, he has time to serve on the board of directors of an insurance company, is Mayor of Danville, is on the board of stewards of the Danville Methodist Church, and is chairman of the board of supervisors of the Yell County Soil Conservation District.

Mr. Chambers is also a farmer, directly managing a dairy farm and is in partnership with a tenant in the production of broilers and beef cattle on another farm.

Soon after graduating from the University of Arkansas Law School in 1940, Chambers became interested in soil and water conservation. At that time he assumed active management of farms previously managed by tenants or by his father, Judge J. E. Chambers.

It soon became apparent to young Chambers that something was wrong with farming as he had known it before his years at the university. Possibly this was because he was now in direct contact with the problems of managing the farm properties. He saw that yields were drastically reduced, fields were gullied, and returns were not up to his expectations.

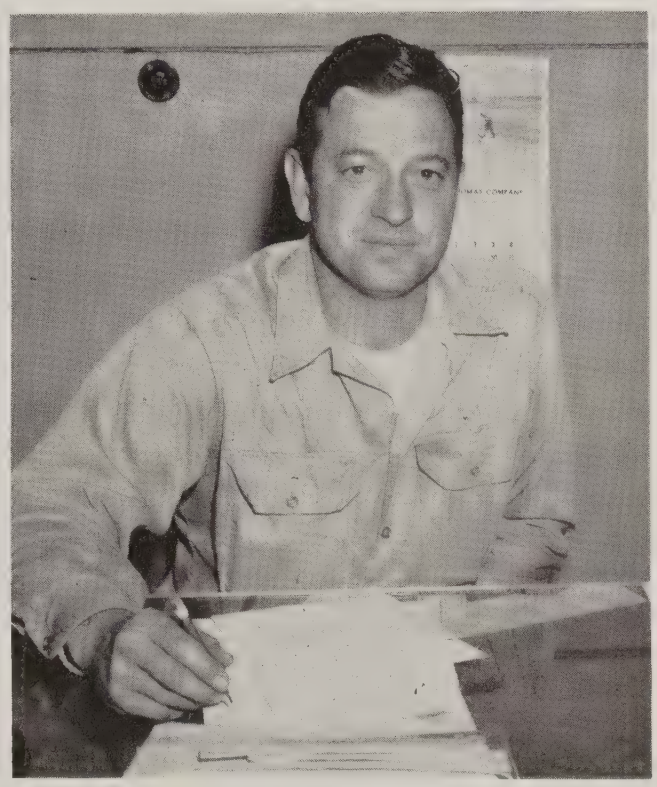
He contacted the local soil conservation supervisors and requested assistance in solving his problems. Working with Soil Conservation Service technicians assigned to the district, Chambers completed soil- and water-conservation plans on all of his farms. Following these plans, he began to construct terrace-outlet waterways, dig drainage canals, sod pastures and meadows, and rearrange fences.

As execution of the plans proceeded, Chambers began to realize that he was no longer just a corn and cotton farmer. Those crops were greatly reduced, while the acreage in grass and grain-grass rotation had increased materially. He had changed his operation from a row-crop enterprise to one of grass and cattle.

Since the development of the original conservation plans, Chambers has disposed of some of the farms. Today, he is concentrating his efforts on two farms; one, a dairy farm; the other farm is primarily in broiler and beef production. These enterprises work well with his conservation programs.

To understand what he has accomplished, one needs only visit Mr. Chambers' dairy farm east of Danville. There on 200 acres of typical Ouachita Highlands soils (small valleys and rolling hills), he has transformed the once marshy bottomland and the eroded upland into a profitable dairy farm. Using Yell County Soil Conservation District facilities and his own resources, Chambers removed the brush, drained the wet lands, and installed a complete drainage system. Parts of this bottomland were seeded with fescue and Ladino clover, the remainder with Dallisgrass and lespedeza. The upland acres were seeded with bermudagrass and lespedeza. All pastures and meadows were limed and fertilized according to soil and crop needs.

Successive droughts and overgrazing caused some losses in fescue and clover stands. These



John Ed Chambers.

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areas are now used for supplemental summer pastures—an essential in dairying operations. Small grain and crimson clover are seeded on parts of the bermudagrass pastures each year to provide winter grazing.

Surplus grasses and clovers produced in the spring and summer are stored as silage.

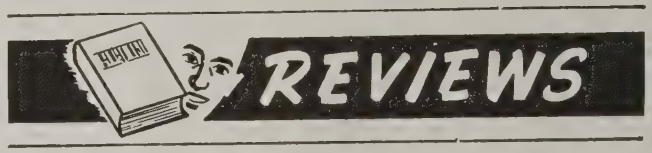
John Ed Chambers' interest in soil and water conservation has not been limited to the operations on his own land. His work is outstanding in all phases of the conservation field.

In 1941, shortly after completing his college work, Chambers was elected a member of the board of supervisors of his soil conservation district. Within a short time his fellow board members selected him to be chairman of their group. He has held this position continuously since that time, except for 3 years spent in the Navy as executive officer of a destroyer escort during World War II.

In 1954, Chambers was elected as one of the area vice presidents of the State Association of Soil Conservation Districts. In this position he worked with the various boards of supervisors in securing many needed programs to advance soil and water conservation in western Arkansas. Equipment owned and operated by districts increased by more than 300 percent. Appropriations were secured by all SCDs through their county courts and at least two districts published annual reports during this period.

The leadership of John Ed Chambers in working with district boards, churches, editors, civic and professional groups, schools, wildlife associations, and others in developing a united approach toward the conservation problems of western Arkansas was instrumental in his selection as president of the State association.

—Fred C. Burns



FARM WATER MANAGEMENT FOR EROSION CONTROL. By R. P. Beasley and J. C. Wooley. 196 pp. Illustrated. 1957. Columbia: Lucas Brothers Publishers. $4.75.

THIS book is published in looseleaf form with substantial bindings. The authors have stated the primary objective of the text is to help students develop the ability to analyze soil- and water-conservation problems, determine the measures needed for effective erosion control, and the design and layout of these practices on the land. This phase has been well-covered, and it is written in easy-to-read style.

The authors have been careful to give adeqate background information to make the text more interesting. It begins with the "Record of the Land and Man's Use of It" through the ages. It is clearly stated that "the conservation of soil and water is of vital importance to people in all walks of life."

This is an excellent text for any student who is preparing to enter agricultural work and especially the professional field of soil and water conservation.

The importance of planning for conservation is brought out. Various soil- and water-conservation practices are discussed in detail. Methods of a coordinated soil- and water-conservation program are included with emphasis on the engineering phases of water management. Practical examples of problems in water management and their solutions are given.

—Hugh A. Brown

MAY 1958

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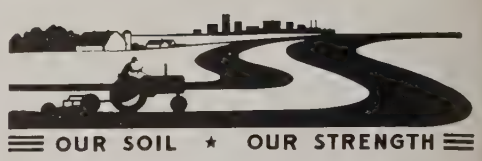
EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.



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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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IRRIGATION ENGINEERS.—The earliest civilizations of mankind were all built on irrigated agriculture. This was not because the first farmers used irrigation to water their crops, nor because irrigation was necessary to produce a surplus of food. Primarily, it was because the irrigated lands remained productive much longer than did the lands where rainfall furnished the water for crops.

We don't know where, when, or how farmers first learned the art and science of irrigation. Probably it was in some of the small valleys that were flooded annually. Possibly it was in the valleys of large rivers that overflowed regularly, such as the Nile, Euphrates, and Indus. Nevertheless, Man became an irrigation engineer long before he learned to write and read, probably before he had any form of stable government over a large area, and before he carried on extensive trade. In other words, he was an irrigation farmer several centuries before he was civilized.

Topsoil and Civilization
Tom Dale and Vernon G. Carter

FRONT COVER.—A 19th century water wheel and gristmill that operated into the 20th century.

Photo by Mildred DiSalvo

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Safety In The Snow

A Winter Training School Teaches Future Snow Surveyors Safety Precautions and Snow Survey Methods.

By VIRGIL S. BECK

TRAVELING thousands of miles by skis, snowshoes, and snowmobiles into remote areas of the western mountains to measure and sample the snow several times during the winter, is a hazardous job and one that calls for every safety precaution.

This is the fact that was stressed to the 100 trainees who attended the Wide-West Snow Survey Training Conference at Jackson, Wyo., January 20–24, 1958. The trainees came from all the Western States, Vermont, Minnesota, Alaska, Canada, and even faraway Australia. In addition, there were about 80 observers and instructors at the conference. The purpose was to train men in how to make the most efficient snow surveys with the utmost safety.

The Soil Conservation Service is charged with leadership in making annual snow surveys. But cooperation is a distinguishing feature of the surveys, so they really are Federal-State-private cooperative snow surveys.

In the winter and early spring around 1,000 trained men make surveys on 1,300 snow courses, covering around 35,000 miles, in the Western States and British Columbia.

During the conference at Jackson, the train-

Note:—The author is information specialist, Soil Conservation Service, Berkeley, Calif.

An overnight bivouac shelter on the Grand Tetons.

ees were separated into four groups of about 25 men each. During the forenoons, the groups attended general instruction sessions together. They were instructed in the theory and practice of snow surveying, travel equipment, preparation for winter trips, snow survey note keeping, first aid, survival in snow, rescue, and other phases of the work.

In the afternoons, each group received field training on different phases of snow surveying. While one group was learning to sample and determine the water content of snow, another was learning how to travel by skis and snowshoes, the third was being trained to drive crawler-type machines that travel over snow, and the fourth was learning first aid and rescue methods.

Each night one group went up on the Grand Tetons for a night bivouac to learn winter survival methods. The trainees, attired in heavy winter clothing, dug fox holes in the snow, lined them with boughs, spread their sleeping bags, crawled in, and bedded down for the night.

Snow surveyors learn to work as teams. Once a month during the winter and early spring, they load their over-snow machine on a truck and set out for the snow course high in the mountains. The truck goes as far as possible, then the over-snow machine is unloaded, and the journey is continued until the machine can go no farther.

Then the two men take to skis and snowshoes. They are equipped with a long hollow tube made of metal, an inch and a half in diameter, with sharpened saw teeth at one end, which they use in sampling the snow courses.

A snow course is a permanently established series of 10 stations in line and 100 feet apart so that the snow is measured in exactly the same place each month and each year. A few

Instructing trainees on safety precautions in skiing at the Wide-West Snow Survey Training Conference.

Instruction is given trainees on safety precautions and the use of over-snow tractors.

are at low elevations, but the majority are located in high remote mountain areas where they are protected from drifting snow and exposure to snow melt.

The surveyors carry with them plenty of warm clothing, skis, snowshoes, nonfreezeable army rations—all articles of food or clothing that are needed for survival.

Arriving at a course, they drive the metal sampling tube straight down until it reaches the ground at each of the 10 sampling points. As the tube sinks, it fills with snow. The depth of the snow then is measured in inches graduated on the outside of the tube. The tube and snow core is then withdrawn and weighed to determine the amount of water in the snow. The average of these 10 sampling points gives snow depth and water content for that course and the adjoining area.

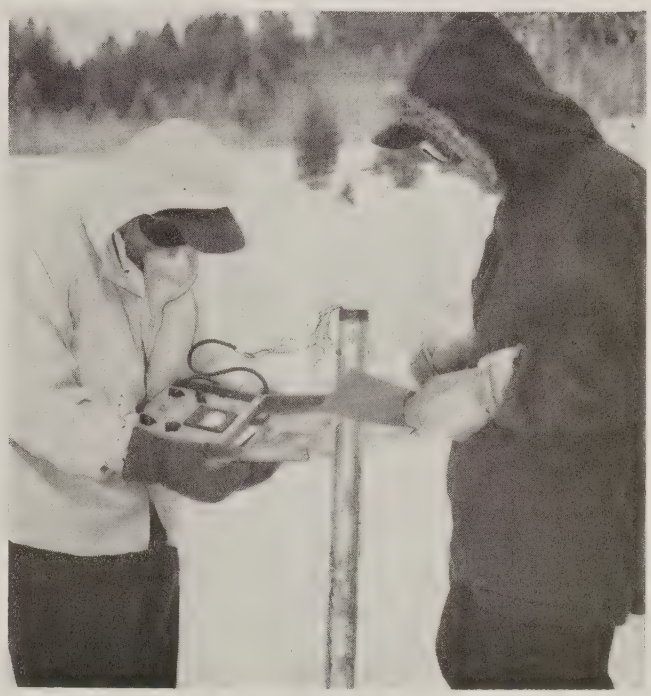
This information, collected by the Soil Conservation Service and cooperating agencies, is correlated and monthly reports are issued. Around mid-April the SCS issues a forecast of the amount of water that will be available from snow melt. Water users in the West base their plans for the year's operations on this forecast.

Snow surveys have been made for many years. Congress made appropriations for snow surveys to the former Bureau of Agricultural Engineering in 1935. The Division of Irrigation, which was in charge of snow surveys, was transferred to the SCS in 1939, and continued to make surveys until 1953, when the Snow Survey Unit was transferred to the operations branch of SCS and became the Snow Survey and Water Supply Forecasting Section.

R. A. (Arch) Work, head of the snow survey program for SCS and stationed in Portland, Ore., reports that during the last 17 years SCS people and their cooperators have traveled 400,000 miles in the roughest kind of country, under the most hazardous climatic and physical conditions, without the loss of a single life—all by ski and snowshoe. This is equivalent to 16 times around the world. Adding to this the travel made by over-snow machines and helicopters brings the fatality-free travel up to 600,000 miles.

This achievement recently was the subject of a citation by the National Safety Council. In a letter to D. A. Williams, Administrator of the Soil Conservation Service, G. C. Stewart, executive vice-president of the National Safety Council, said in part:

"I know this work involves serious problems of coping with such hazards as over-mountain travel in remote areas and in extremely cold temperatures, with constant danger of avalanche conditions, blizzards, and other hazards involved in travel at high altitudes and under mountainous conditions. So I am sure it must indeed be gratifying to you that this work has been carried out so effectively for the past 17



Measuring the water content of soil beneath the snow pack with a Coleman meter.

years with 800 to 1,000 employees in the mountainous Western States, and that not a single life has been lost.

"On behalf of the National Safety Council, I wish to commend you, all the men in your organization, and all those cooperating with them, for the job they have done in safeguarding the lives of the people engaged in this hazardous undertaking."

Channel Improvement

A Group of California Farmers Check Flood Damage and Improve Their Land by Straightening and Improving the Channel of an Intermittent Stream.

By BILLY R. BRUNER

TURKEY raiser Fred Huntsinger and dairyman E. G. Schwartz, who farm along the Bouquet Canyon Channel, in Los Angeles County, Calif., aren't much disturbed over the prospects of "flash rains" and seasonal watershed runoff.

For the first time in years, they're saying, "Let 'er rain."

Actually, Schwartz, Huntsinger, and their neighbors, Louis R. Moreno, Paul Benz, and the Los Angeles County Juvenile Department's boys camp, will tell you they have never had things so good—flood preventionwise, that is.

To begin with, Bouquet farmers weren't farming top land. Like a growing number of coastal farmers, they had succumbed to the pressures of urban expansion. With freeways, factory sites, supermarkets, and housing additions going in around them, the farmers simply couldn't afford to farm their rich San Fernando Valley acreages.

Note:—The author is work unit conservationist, Soil Conservation Service, San Fernando, Calif.

Bowing to the urbanization tide, the farmers used a combination of community teamwork and land-treatment work to turn less fertile lands into moneymakers.

Reason for the smugness of the farmers today, is a carefully reamed out creek channel, which safely controls rampaging flood flows from Texas and Vasquez Canyons.

The $40,000 channel improvement job is a team project, carried out by the Upper Santa Clara Soil Conservation District under a cooperative agreement with the Federal Government. Several agencies cooperated in the undertaking, including the Soil Conservation Service, which provided technical assistance, and the Agricultural Conservation Program Service, which shared nearly half of the cost.

Over the years, the farmers had taken some solid beatings from Bouquet Channel. Torrential rains swelled the shallow, debris choked stream and overflowed some 70 acres of cropland. The 1938 flood, for example, reduced the land to less productive use.

There wasn't much the farmers could do about highwater singlehanded. Schwartz spent around $4,000 trying to keep water off his lands. Most of this conservation work went

John Alden, of SCS, Ira D. Cate of ASC, and Fred R. Huntsinger, turkey raiser, discuss the Bouquet Canyon channel improvement project.

SCS technicians discuss Bouquet Canyon channel plans with E. G. Schwartz (right) in the bed of the completed channel.

down the drain. Staving off floods wasn't easy with homespun techniques.

When the 1953 flood cut big chunks in their acreages, scoured fields, and spread a layer of rock and silt on lands, the farmers decided it was high time to tackle their flood problems together.

Through a pooling agreement with their soil conservation district directors, the group received engineering help from SCS technicians with the farmers and ACP sharing the cost of the channel improvements.

Flood prevention work consisted chiefly of deepening, widening, and straightening more than a mile of the channel, beginning at the west boundary of the boys camp and extending upstream through Huntsinger's property, through a portion of Moreno's ranch, across Schwartz' farm, and again through Huntsinger's turkey ranch.

Farmers didn't take any chances on the newly shaped banks eroding again. Los Angeles County purchased soil-holding black locust seedlings and planted them along the rim of the banks. Schwartz and Huntsinger chipped in and bought California bamboo plants from the Antelope Valley Soil Conservation District nursery, and the county put them in at the toe of the slopes.

With the flood problem buttoned up, Schwartz and Huntsinger figure to get a lot more good out of their heretofore useless lands.

Schwartz puts things this way: "It's now safe and profitable to improve and develop my potentially high-producing land and put it into better paying crops. I'll get some good pasture by filling the swales and grading the wet areas back from the creek channel. This year for the first time, my cows will get good grazing from all my fields."

And Huntsinger says, "Since I bought my farm in 1951, I've needed more green feed for my turkeys. But until we got the channel work in, it was just a waste of time and money to improve the waste areas. I'm really proud of the way we teamed up together to lick the floods. And we're all mighty pleased at the helping hand we got from SCS and ACPS."

Neighboring farmers are already supplementing the channel job by building erosion-control dams on the watershed feeding into the creek and thus putting the final clincher on high intensity storms.

CONSERVATION IS EVERYBODY'S BUSINESS because it affects everybody. The battle will be almost won when enough of the people realize their own personal stake in sound conservation practices.

EZRA TAFT BENSON,
Secretary of Agriculture

Learning By Doing

Vocational Agriculture Students Learn About Soil and Wildlife Conservation Through Cooperation With Their Instructor, Their Dads, the Local Wildlife League, the Soil Conservation District, the SCS, and the ASC Committee.

By H. A. NOTTORF

THE Vocational Agriculture instructor and Soil Conservation Service technicians at Columbia, Mo., have teamed up in a teaching-application program that has put soil consercation plans on 36 farms in the Boone Soil District. More than that, the program is making conservation farming a way of life for many Boone County boys who otherwise might not have had the opportunity to learn this method of farming. Parents, too, are now enthusiastic about conservation work where before, some were reluctant.

The program had its beginning in an unusual way. The Boone County Wildlife League was interested in working with youth groups on wildlife preservation. Their Executive Secretary, Charlie Bell, discussed this with Dave Schneider, Vo-Ag instructor of Hickman High School. The league was willing to offer awards to those boys who did outstanding work toward development of wildlife habitats.

Schneider, interested in a good program of both wildlife and soil conservation, suggested that the Soil Conservation Service be asked to assist in the program. He explained to Bell that SCS plans included both wildlife and soil conservation. As a result, a meeting was called by the Boone County Wildlife League. Both Schneider and C. H. Dunn, work unit conservationist for SCS, were asked to attend and explain how they could contribute to the program. It was agreed that all phases of conservation pertaining to both soil and wildlife would become a part of the Vo-Ag course of study. Dunn and Schneider would initiate the program and the wildlife league would contribute their awards to boys who made the greatest contribution and most progress in establishing both soil- and wildlife-conserving practices.

As a starter, Schneider, with technical advice from Dunn, gave instruction on soil classification. The boys made soils maps of their farms; then, their classifications were correlated with soil surveys made by the SCS soil scientist.

The land was classified according to its texture, depth, erosion, steepness of slope, droughtiness, inherent lack of plant nutrients, and parent material. With these facts to build on, a good conservation plan could be developed.

Working with their dads on their own farms,

Max Shirky, Dave Schneider, and Don and Charles Gibson inspect a new grass waterway.

Note:—The author is management agronomist, Soil Conservation Service, Columbia, Mo.

Vo-Ag instructor, SCS technician, father, and FFA boy inspect a gully that is to be converted to a grass waterway.

the Vo-Ag students requested assistance from their soil conservation district in planning and developing a good conservation program on their home farms.

Naturally, the board of supervisors of the district was pleased to approve the requests for such wholesome cooperation, and Schneider and Dunn lost no time in organizing group training and planning meetings for the farms.

During the second stage, on each farm, the group got down to the business of developing the plans. After determining the capabilities, the future land use was agreed upon. Some land was best suited for pasture, some for woodland, some for wildlife, and other land was adapted to cropland.

On the cropland, where erosion could not be controlled by a desired conservation rotation plus contour tillage, a water-disposal system was designed which, coupled with the vegetation, would give the necessary control.

Sod waterways, terrace systems, and new field arrangements to fit the rotation and contour farming patterns were planned. Rotations were designed to fit the soil, to obtain maximum continuing production, and to supply the feed needs of the farm. Sometimes new fences were planned on the contour to fit new field arrangements.

The boys really enjoyed the sessions; and, by actually seeing the problems, analyzing the facts, and working out solutions, they could get a better grasp of the situation than by classroom discussion. Of course, the dads got a lot out of it too, and sometimes had the neighbors over to take part in the discussions.

During the last phase, the practices planned were actually put on the land. Again the boys, their dads, Mr. Schneider, and the SCS technician worked together as a team. The boys took turns on the level and rod, staking terrace and contour lines. They kept notes and learned whether to add or substract for the correct rod reading to make certain the water would run the way they wanted it to go.

They ran tractors to construct plow-built terraces and spread the right kinds and amounts of fertilizer to get the grass well started in the sod waterways. The "learn by doing" phase became reality, and everyone gained enthusiasm and understanding by working out and establishing the plan.

The most outstanding feature of this cooperation is that practically all of the dads became enthused about the activities and a lot of conservation work was accomplished as a result.

This program has increased in scope. Each year, a new group of Vocational Agriculture students begin with farm plans; thus conservation planning has become a continuous process in this school. The SCS, Vo-Ag, and ASC work together and stand as a three-legged stool in the promotion of conservation.

So far, 30 farms have been planned this way. Each year Schneider makes room in his heavy

SCS farm planner, Vo-Ag instructor, and father confer with two FFA boys about the success of a new grass waterway.

class schedule for planning several more farms by the group discussion method. Since 1956, he has requested that each student develop a conservation plan on his home farm. Max Shirky, SCS soil conservationist, who works with Dunn on the conservation planning activities, has worked with each boy and his dad on their plans. Shirky reports that many of the boys are doing an excellent job on their farms.

In 1957, 21 acres of sod waterways, 7 miles of terraces, 260 acres of contour farming, 90 acres of pasture plantings, and 10 ponds were constructed.

There are 43 FFA members in Boone County who are working on their conservation program during the school year 1957–58.

RANGE IMPROVEMENT—

A Challenge To Research

No. 33

This is the thirty-third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By WESLEY KELLER

MANY notable achievements may be credited to the 50 or more years of research on the Western Range. The major range types have been defined and much has been learned about the vegetation. Thousands of experimental plots have contributed to the testing and appraisal of many introduced and native forage plants, chiefly grasses. A body of knowledge and experience has been built up which enables a skilled rangeman to "read" the range and recognize its current productivity as compared to its potential.

Widespread overuse has been recognized and management practices intended to lead to range improvement have been developed and started wherever possible. Much has been accomplished in the development of mechanical and chemical means, as well as by fire, to economically and effectively eliminate low-value vegetation and prepare a suitable seedbed for grass.

This work has been paralleled by the seeding of several million acres of abandoned cropland and the most favorably situated rangeland to a few well-adapted species—the most important one being crested wheatgrass. Yet, a great deal more needs to be done to minimize failures under the more favorable conditions, and to extend seedings out beyond the fringes of the cultivated lands into the tougher sites that make up the bulk of the Western Range.

Suppose we look briefly at this Western Range. It occupies three-fourths of the western half of the country, or over 700 million acres. The range is not only very large, it is also highly heterogeneous, especially when compared with cultivated lands in the mountain valleys of the West. The free interaction of altitudes, exposures, and slopes assures tremendous differences in climate as well as in soil. Aside from its heterogeneity, there is perhaps only one characteristic in which the range is consistent; it is submarginal for cultivated crop production.

The productive powers of the range are low because of the paradox that, in general, the most productive soils occur where moisture is most deficient, and the least productive soils are where moisture is most adequate. Soils capable of high production are found at high elevations (where moisture is adequate), but here temperatures are low, the growing season short, and plant growth generally limited thereby. But with all her differences, the range is clothed with vegetation which has, over the ages, grouped itself in response to the total environment into about 10 major types, each with somewhat distinctive characteristics.

Note:—The author is agronomist, crops research division, Agricultural Research Service, Beltsville, Md.

The bulk of our rangelands in some of these types can be restored to high productivity by correct grazing management alone. Although, to determine what is correct grazing management is another big job for research. On many millions of acres grazing management alone is not adequate. It may be too costly, because too slow. And when low palatable invaders come in, it may be inadequate to even check their spread. A striking example of this is the extensive invasion of mesquite on Southwestern rangelands. The recent drouth accelerated the rate of mesquite invasion; but, no method is known, short of direct attack upon mesquite itself, of removing it from the range, or even of appreciably retarding its spread. Each year the attack is delayed, the ultimate cost increases.

Consider for a moment the pinyon-juniper type of range, occupying approximately 75 million acres. The better parts of this type of range will produce good crops of forage when seeded after removal of the trees, but this is costly. Research has not yet come up with an inexpensive, effective method of eliminating pinyon-juniper. Large forests of pinyon-juniper with fairly high forage potential, are at present yielding very little feed.

The job of range improvement, of meeting and mastering the several specific problems presented by each type or division of a type, is neither simple nor impossible. Like every other problem research has tackled, it will yield in proportion to the research effort expended on it.

Up to the present time research aimed at improvement of the Western Range has paid large dividends. But, the total research effort has been so inadequate, in relation to the total problem, that nearly all the effort has been expended on the most favorable sites available —those most likely to respond to practices growing out of a minimum research effort. If we are ever to obtain the maximum continuing benefit from all our rangelands, our total research effort will have to give much more consideration to extensive areas, which will probably respond more slowly and less abundantly.

We can surely move on to problems incomparably more difficult than those we have centered on up to now before there is any real likelihood that the benefits gained will not justify the cost. It is entirely possible that before

The sagebrush-grass type occupies more than 90 million acres of the Western Range. Overgrazing has reduced the grass and increased the sage in most areas. Improvement will require sage removal, grazing management, and, in some cases, grass seeding.

we reach this point weather control will have eliminated our moisture deficit and greatly enhanced the productivity of much of the Western Range.

Improving rangelands by seeding has been generally successful in the more favorable parts of the sagebrush-grass, the shortgrass, the Pacific bunchgrass, and open forest types of range. Yet failures have been too common. It is a reasonable assumption that failures are most frequently a result of unfavorable turns of the weather. It is also a reasonable assumption that failures would be considerably reduced if more consideration were given the requirements of the germinating seed and growing seedlings, and less hope placed upon "breaks" in the weather.

To determine the minimum requirements of range seeding, from the standpoint of the physiology of the germinating seed and the developing seedlings, is one of the important problems which research urgently needs to examine. Research over the years has taught us a great deal about what happens when rangelands are seeded under different conditions, but it is something of a shock to realize how little we know about why we obtained the observed results.

The pinyon-juniper type of range covers about 75 million acres, scattered around mountain valleys and on mesas of the southern part of the Western Range.

Forty million acres of salt desert shrub on the Western Range are an important winter range for sheep. Some can be improved by grazing management; but, millions of acres have been invaded by noxious species for which no economic control is known.

Why is it that crested wheatgrass will often succeed under conditions where several other species may fail? Is crested wheatgrass able to germinate in less time, or at lower temperatures, or with less moisture? Does it withstand heat, cold, wind, or drouth better as a seedling? Is its nitrogen requirement lower? Does it send down roots faster, or farther? Is it more efficient in the use of water? Does it go more completely into dormancy in warm weather? Does it grow at lower temperatures than other grasses require, or faster at minimum temperatures for growth? Which one, or combination, of these is the correct explanation? Or is the explanation to be found among an endless number of other possibilities not listed?

Perhaps we know some of the answers, at least when the comparison is between certain species; but, we need to think much more in terms of *why* in connection with the many results we observe. Among other things, we need much more complete data on both the soil and the microclimate. There is a logical explanation for every success or failure in range seeding, in terms of the physiology of the seeded plant. When we have learned enough to predict the outcome of seedings, on the basis of

(Continued on page 216)

PRODUCTIVE FARMS WITH ABUNDANT WILDLIFE

By D. A. WILLIAMS

CONSERVATION becomes particularly more urgent as well as more difficult as our human population grows. There is more and more pressure on less and less land for more of everything that land provides—more food, more fiber, more wood, more water, more wildlife, more recreation, and more room for just living and working.

A large part of the solution to today's conservation problems can be found in the field of agriculture and in the hands of the private owners and operators of land. Land, together with its component elements of soil, water, grass, trees, and wildlife, is the physical object of conservation.

About four-fifths of all our land is in farms or used for grazing by farmers or ranchers. Most of our water falls on agricultural land and is therefore first of all an agricultural resource. Most of our timber grows on private land. Four-fifths of the game produced and hunted is on land under private control. Thus, any approach to the land, of necessity, must be mainly through its use for agriculture, and through the attitudes and actions of the men who, under our cherished American system, have great latitude in the management of their affairs and their property, including land.

Agriculture does displace some wildlife by altering its habitat. At the same time, agriculture creates new habitats—for the same kinds of wildlife at other locations, or for other kinds of wildlife whose requirements are better suited to an agricultural landscape. As a result, *there is probably more wildlife today than when our forefathers first saw our land.*

As you travel anywhere in the country today you can see the evidence of conservation progress based on a new concept of conservation. Modern soil and water conservation means putting to work on the land needed combinations of effective practices—combinations planned for and fitted to each acre of land, according to the use for which that land is best suited.

This new land-use pattern, which respects the capabilities of the land, of a necessity includes a place for wildlife. Some land is permanently dedicated to wildlife. The farm or ranch, planned and managed as a whole, produces wildlife as a *primary crop* on some areas, and as a *by product* on the entire land unit.

The existence, in the form of soil conservation districts, of organized, local conservation efforts by farmers and ranchers has been the greatest single factor in the conservation progress made in the last 20 years. Today there are 2,779 soil conservation districts that include about 93 percent of all the farms and ranches of the country and have 1,728,000 cooperators.

The time is right for sportsmen and wildlife organizations to join with soil conservation districts in a potent working relationship that will benefit all land resources and users of these resources. No other approach to the solution of basic soil, water, and wildlife conservation problems can equal the potential of such a partnership.

Conservation farmers and sportsmen have much to offer each other. Farmers are the owners and custodians of most of the land on which sportsmen want to hunt and fish. They protect and feed the wildlife, even though they do not own it. They can manipulate the environment in such a way as to increase wildlife populations. They can create dual-purpose water developments that serve both agricultural and recreational purposes. They represent respected farm leadership in the community and can influence adoption of favorable wildlife activities.

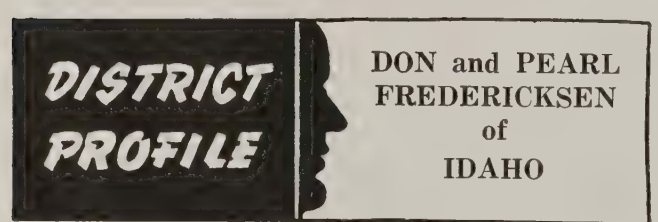
Sportsmen can support, locally and national-

Note:—This article is a digest of a talk by the Administrator of the Soil Conservation Service at the North American Wildlife Conference, St. Louis, Mo., March 3, 1958.

ly, the programs and developments that will strengthen and help soil conservation districts. They can help non-farm people to understand farm problems. They can help others to see that wildlife comes from agricultural lands—that wildlife is a crop as truly as corn, forage, or trees—to be produced by conscious land management. Many farmers are themselves ardent sportsmen, and would welcome the further association of organized sportsman groups.

Sportsmen can find ways of giving one or a group of farmers specific help in a conservation practice or development of value and benefit to the farmer, to the sportsman, and to the community. They can assure farmers that they will be adequately compensated for extra effort or sacrifice of income incurred in producing wildlife harvested by sportsmen. They can develop means of protecting farmers from undue harassment by hunters or fishermen.

Both groups can do these things in the knowledge that working together they can each reap from the land those products which it can yield so bountifully when it is used and developed within its greatest capabilities. We *can* have productive farms and abundant wildlife—at the same time.



DON and PEARL FREDERICKSEN of IDAHO

ALMOST everyone who lives out in the country in Idaho, and many of those who live in cities and towns, know Mr. and Mrs. Don G. Fredericksen of Gooding, better known as Don and Pearl. And those who know them admire them because of their activities in agricultural and rural leadership, with the accent on soil and water conservation via the soil conservation district route. They have come up through the ranks until they are also active in soil and water conservation and other agricultural affairs nationally.

Don is the Area 7 vice president and chairman of the Western States public lands committee in the National Association of Soil Conservation Districts. He has been president of the Idaho Association of Soil Conservation Districts for 3 years and previously served as a division director. For 10 years he has been chairman of the governing board of the Gooding Soil Conservation District. He is a member of the Thorn Creek Cattlemen's Association, and is active in the State and National organizations with which it is affiliated. He has served 19 years on the Gooding school board, and he is a Rotarian. He is a native of Nebraska.

Formerly, Pearl was Miss Woody, a registered nurse, before she became Mrs. Fredericksen. She was one of the founders of the auxiliary to the Gooding SCD, and in 1949 helped establish the State auxiliary. Two years later she became the first president of the National auxiliary. She is frequently called to do emergency nursing services in the Gooding community. Homemaking duties and public service teamwork with Don keep her schedule overflowing.

The Fredericksens have two sons. In 1957, Bob interrupted his freshman year at the University of Idaho to start Army service. Gene is a student at Gooding High School. One or both will take over responsibilities in the ranch operations when Don and Pearl are ready to ease off and devote more time to rural and State improvement projects.

Don is a cattle and sheep rancher with about 250 Hereford cattle and about 200 sheep. He has nearly 550 acres of irrigated cropland in addition to range; he raises hay, mixed grains, pinto beans, and grass seed.

Don is a firm believer in the use of grass as a soil builder and seeds smooth bromegrass and orchardgrass in all of his hay. He's one of the country's greatest boosters for Idaho "bakers", but does not raise potatoes commercially.

When Don is away from home, maybe for a week or more during the annual and divisional soil conservation district meetings in Idaho, or when the State legislature is in session, Pearl usually remains at the ranch and keeps it going. She takes care of the correspondence and other communications in her husband's extracurricular activities. But she frequently travels with Don as his aide in problems immediately at hand.

Because of their teamwork in common causes,

Pearl's over-all role is as important as that of any private or confidential secretary or executive assistant. Her portable typewriter is as much a part of their traveling gear as a suitcase. By the time Don comes into the house in the evening, after a day's work on the range or in the fields or woods, the day's routine mail is answered and ready for his signature, the schedule for phone calls awaits him, or the copy has been roughed out for the next issue of the State SCD Newsletter. She is an excellent typist, as well as homemaker, nurse, and all-around helpmate.

"Loading up the chuck wagon" and heading for the woods to hunt deer and elk or fish for salmon or trout is an important event for all of the Fredericksens, as well as for the hired man and his family who frequently are asked to "come along."

Seasonally, when Don and his boys need a few days of off-ranch work, a trip to the woods on a pole-cutting expedition sends the trucks home with loads of unmarketable timber that fits into farm and ranch fencing and other similar needs. Fishing gear and guns are standard equipment on these jaunts.

Don has a lot of pride in the 10-year old Gooding Soil Conservation District. It is a stepchild of neighboring Wood River Conservation District, which extends about a mile into one part of Gooding County. Through Don's leadership and the teamwork between the governing body, SCS technicians, and others, operators of about 500 of the 1,000 farms and ranches in the districts are cooperating in the district's program. These operations cover about 97,000 acres.

From its earliest years, the Gooding District has operated a fleet of heavy and other equipment to assist farmers in applying soil- and water-conservation practices to their land. The district is a good cooperator with the Idaho State Fish and Game Department. Outstanding achievements in the conservation of wildlife have been obtained through dovetailing programs of the two organizations. Annually, the district sponsors a joint banquet of cooperators and Gooding businessmen, with the soil conservation district footing the bill.

Don is a leader in the Idaho State Wildlife Federation, has been a division president, and is a member of the local affiliate. Naturally, the

The Fredericksens.

950 acre-foot stockwater pond is stocked with rainbow trout. The project was built with cost-sharing assistance from the Agricultural Conservation Program. Don has worked closely with the Idaho State Fish and Game Department in getting more and better roads into camping and recreational areas.

With Fredericksen's guidance, the State Association of Soil Conservation Districts has developed added strength and leadership at the district governing body level. Within the association and its affiliates, this has been accomplished during the past 3 years, largely during a series of annual training, educational, and administrative conferences.

The work with the State legislature in 1957, with leadership and teamwork on a statewide basis, was especially potent when it obtained total rewriting and replacement of the State soil conservation district's law, enactment of legislation to permit Idaho participation in the Federal small watershed program, and made the first appropriation ($2,000) that the State had ever made in support of its State soil conservation district commission.

Pearl has exerted strong local, State, and national leadership in advancing inclusion of soil and water conservation teachings and study material in public school courses. In Idaho, this

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is a direct responsibility that the auxiliaries have accepted at the invitation of the Idaho State SCD Association. The national speaking contest and local poster and essay contests are annual programs for the auxiliary group. Likewise, these auxiliaries have sponsored the annual Soil Stewardship Week observances throughout the State. Through contacts with ministers and other leaders in the churches, the auxiliaries have developed cooperation and have distributed materials provided by SCDs and cooperators.

—HUGH F. EAMES

CONSERVATION CAMP.—The State University of New York College for Teachers at Buffalo provides experiences in conservation to its biology students at a 435 acre camp in Cattaraugus County. Students spend a day or a day and the night at the camp during the spring term. Their experiences include tree planting, maintenance of farm ponds, shrub planting, and other habitat improvements for wildlife. Field trips to acquaint students with plants and animals in their natural habitats and to interpret conservation problems and practices on the land are part of the program of instruction. Located in an area with much abandoned farm land, the camp is a cooperator with the local soil conservation district, the New York State Forest Practice Act, and the Soil Bank Program; furthermore, it is a wildlife refuge.

MINIMUM TILLAGE.—Farmers, througout the Nation, are becoming more and more interested in minimum tillage because of soil compaction problems. Minimum tillage saves labor, tractor fuel, and depreciation of machinery while helping improve soil structure. Cultivating the soil is profitable only when a specific problem, such as seedbed preparation or weed control, requires it. The oftener a tractor and heavy implements are run over a field, the greater the danger of soil compaction that may result in traffic pans that prevent moisture penetration and normal root growth of crops.

RANGE IMPROVEMENT

(Continued from page 212)

our knowledge of the plant's physiological response to its environment, we think we will be in a position to project this knowledge to areas not experimented upon, with a high degree of confidence.

A study currently in progress on depleted rangeland at high elevations is designed to yield such information. Another aspect of this study is the exchange of a pickup truckload of soil between the depleted site and the valley below. We expect to learn from this "displaced" soil, in comparison with that representative of each area, the relative limitations of the soil at high elevations, about which something might be done, and the climate which we cannot yet alter.

Only a few of the many problems connected with range improvement by seeding have been mentioned. Likewise, only a few of the available methods of attacking these problems are discussed. The sample, however, should indicate the magnitude and complexity of the problem.

Of one point the writer feels certain. The Western Range with its beautiful mountains and forests, its endless miles of sometimes drab and rather barren aspect, its low per-acre productivity and great diversity, adds up to a tremendous National resource which is, and will likely continue to be, a challenge to research.

THE RESOURCE CONSERVATION JOB is too big for any one agency or group, governmental or private, to do alone. It is essential that everybody work together at the job of proper use of the land and the water that enables the soil to produce the food, fiber, grass, timber, and wildlife we need.

D. A. WILLIAMS, *Administrator,*
Soil Conservation Service

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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CONTRACTORS HELPED.—Dukes Soil Conservation District supervisors (Martha's Vineyard, Mass.) saw the need of land clearing with a brushcutting machine. But private contractors were not equipped with this type of machine and were reluctant to invest in one without knowing how much business they could count on.

So the supervisors bought a brushcutter for the use of district cooperators. It was put to work immediately and has been kept busy ever since. Recently, the supervisors sold the brushcutter to a local contractor. In the meantime, private contractors had bought five brushcutters of their own. The district had shown there was steady demand for this service. Now it has turned over all of this work to private contractors.

—EZRA SHAW

Editors are invited to reprint material originating in this magazine.

FRONT COVER. — Stripcropping patterns in Coon Valley, Wis.

Photo by E. Cole

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New Research For The Great Plains

Agricultural Research Service and Soil Conservation Service Scientists Discuss New Solutions for Old Problems at a Conference.

By TARLETON JENKINS

THE stocky man with the weather-tanned face finished his report and sat down. But Howard J. Haas, soil scientist on the Agricultural Research Service staff, at Mandan, N. Dak., did not get to rest long.

Questions popped from all sides. What would his findings mean in dollars per acre to the farmer? How large was the area involved? What were the findings in drier years?

It was evident that Haas had touched on a subject in which many of his listeners were interested. He was reporting, in Denver in February 1958, on his study of the practice of fallowing land in growing wheat on the Northern Great Plains.

A majority of the audience were technical men of the Soil Conservation Service. They were joining their opposite numbers in the Agricultural Research Service for a discussion of research information that would help the SCS men in their soil- and water-conservation efforts in the Great Plains.

This was not the first of these joint ARS-SCS huddles to find answers to knotty problems the SCS men had encountered. In Chicago in 1956, and in Colorado Springs in 1957, they had tussled with problems involving the irrigation and drainage of land. And in Charleston, S. C., a conference had bored into the problems relating to too much salt in soils.

As in the other sessions, the SCS technical men had given the answer-hunters of ARS lists of questions concerning problems on which they needed help.

What Haas had said was substantially this: Farmers, in certain wheat and small grain producing sections of the Northern Plains, can use fertilizers in given amounts and make use of all of their cropland *every year*. It would mean putting protective plant cover on lands, which, under the present system of fallowing, leaves the land bare of protective residues much of the time. It would mean a more efficient system of farming—something that agricultural leaders in the whole Great Plains are now earnestly seeking for the entire area.

Haas was reporting on 3 years of experimenting with the use of nitrogen fertilizers in the cropping system of the area. He had found that fertilizer—preferably in 40-40 amounts of nitrogen and phosphate—had led to yields of wheat almost as good as wheat-following-fallow. Cost of the fertilizer, he said, was $9 an acre.

The practice would be most effective in years of normal or higher rainfall. In the years 1956-57, Haas had noted evidence of moisture shortage.

In wheat-following-corn, a 20–40 combination of fertilizer worked as well as wheat-following-fallow. The cost was about $6. The wheat yield was 26.9 bushels an acre.

What would this mean in cash to the farmer? Well, multiply the added yield by the price of wheat, and subtract the cost of the fertilizer and the other costs (above the expense of keeping weeds out of fallowed land) and the profits would be around $25 or $30 an acre.

Haas reported that studies in 14 States showed greater losses of fertility in the wheat-fallow system than in continuous small grains. And fallow, he pointed out, saves only about 20 percent of the moisture that is available during the season. The greater contribution of fallow is often the saving of soil nutrients. Therefore, if the nutrients can be added in fertilizer, fallow may be eliminated.

Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.

Howard Haas of ARS is the focal point in a discussion on the use of fertilizers in wheat growing on the Northern Plains. Others in the group are: (left to right), T. L. Gaston, Ross Davies, L. G. Wolfe, W. F. Keller, E. H. Sandberg, and Cyril Luker.

At the North Platte Experiment Station in Nebraska, a study had been in progress for 9 years on the effect of residues and supplemental commercial fertilizer on winter wheat. Soil Scientist R. E. Ramig, reporting on results, stated:

"In the alternate wheat-fallow cropping system, there is a trend toward higher wheat yields where the residues are left on the soil surface by subtilling. Significant yield differences due to residue management, occurred only in 1953 and 1955, when yields were highest where the stubble had been subtilled . . .

"During the drouth year of 1955, wheat yielded 38 bushels where the stubble had been plowed, burned and plowed, or one-way disked, and 47 bushels where the stubble had been subtilled. This difference in yield resulted because the subtilled stubble had reduced runoff losses and stored more water in the soil during the fallow period. This additional stored water carried wheat on these plots through a drouth period, at heading time, when the other plots suffered drouth stress. Later, timely rains produced good wheat yields, but the drouth-damaged wheat on the burned and plowed, plowed, or one-way disked plots did not have the yield potential of the wheat on the subtilled plots.

"Nitrogen fertilizer has had little effect on wheat yields for any of the residue managements practiced in the alternate wheat-fallow system."

Results of an evaporation control study at Manhattan, Kans., were reported by Soil Scientist R. J. Hanks:

An excerpt: "We have been investigating the influence of a chemical waterproofing agent on evaporation. By the use of this chemical it is possible to eliminate liquid flow through the treated soil. The data show this method of evaporation control is effective in the laboratory.

"Tests . . . show that a soil mulch is much more effective in decreasing water vapor flow than gravel or straw mulches."

Soil Scientist J. J. Bond's report dealt with dryland-cropping practices. The tests he reported were at the Southwestern Great Plains Field Station near Amarillo, Tex.:

"More total wheat is produced with continuous cropping, but over a period of years the results show that a wheat-fallow rotation on a given number of acres will yield about 90 percent as much as continuous wheat. A wheat-fallow rotation compares very favorably with continuous wheat, when consideration is given to the seeding and harvesting expenses . . ."

At Big Spring, Tex., Soil Scientist Earl Burnett had been working on grass establishment:

"Generally speaking, the recommended procedure after seeding is to leave the seeding alone until heavy weed growth starts in the spring. Then it is possible to use a weak 2,4-D or 2,4-5-T spray for weed control . . . Experience has shown it is a desirable thing to do if a stand is desired . . . Since these chemicals have been available it has been possible at a number of stations to almost insure stands. Of course, there is some danger to the young seedling plants. However, when concentrations are relatively low, the damage is usually not severe."

From a report on the work of Soil Scientists B. W. Greb and A. L. Black at the USDA Central Great Plains Field Station at Akron, Colo.:

"The general effects of manure on crops grown continuously has been to increase grain yields under favorable moisture conditions and to decrease grain yields under unfavorable moisture conditions. There has been a general increase in straw and/or forage under both favorable and unfavorable moisture conditions under continuous cropping."

In the unending search for grasses for the Great Plains, George A. Rogler, ARS research agronomist, noted findings on the principal grasses on which the tests have been conducted, as follows:

Crested wheatgrass: Can be rated one of the most successful of the introduced grasses. Other grasses or legumes may be planted with it, but it should be the basis of the mixture. Nordan variety of Standard, developed at the Northern Great Plains Station and released in 1954, is superior in quality of seed and seedling vigor. Close correlation has been found between seed weight and seedling vigor.

Russian wildrye: Has proved its ability to survive drought. It has been more palatable during midsummer and fall than most seeded grasses. It makes rapid recovery after defoliation, even in summer, if moisture is available. Protein content of the leaves remains unusually high even at seed maturity. Seed supplies of Strain 2355 are being built up and are due for release soon—possibly this year (1958). Greatest improvement shown by this strain is in resistance to lodging and in seed production (75 percent above commercial).

Intermediate wheatgrass: Earlier recommendations have been over-optimistic, but when properly used in specific areas it is of great value. It is less hardy and drought resistant than crested wheatgrass and Russian wildrye. It tends to be short lived when grown on the borderline of adaptation. Gains per acre and dry-matter production declined as stands grew older. (Under equivalent conditions, stands of brome-alfalfa remained in excellent condition.)

Bromegrass: This introduced sod-forming grass is highly important to the areas in which

Charles J. Whitfield of ARS (at end of table) presides at a discussion on stubble mulching. Around the table (left to right) are: Earl Burnett, R. E. Ramig, and B. W. Greb of ARS, with Dolph Craig, Maurice Gamble, and Joe Turelle of SCS.

it is adapted. The southern types when grown in the north are more aggressive and form a denser turf than northern types, but they are lower in nutritive content. When mixed with alfalfa, they tend to reduce the alfalfa in the stand. Southern types will survive a more severe dry spell in the north than the northern types.

Green stipagrass: This is an improved variety of green needlegrass, a native perennial, cool-season bunchgrass. Seedlings resist soil blowing, grasshopper injury, and drought. Mature stands are well-adapted for pasture use because of high production and rapid recovery after defoliation. Seed is highly dormant and germinates only about 20 percent the first year. Older seed germinates on a larger scale.

Western wheatgrass: Seed production has not been very successful under cultivation. Stands have been difficult to establish under range conditions because of slow germination and seedling growth. Tests have shown mixtures of this grass with green needlegrass and blue grama to be outstanding.

Legumes: Alfalfa is the best perennial legume for reseeding purposes. Plantings of other exotic and domestic species have shown some to hold promise, but none has equalled alfalfa in performance. Most adapted varieties can maintain stands under grazing either when planted alone or with grass. Crested wheatgrass-alfalfa mixtures have proved somewhat more successful than brome-alfalfa mixtures.

Warm-season grasses: Local strains must be used and should not be moved farther than about 200 miles north or south. Among the northern Plain States, western Nebraska is the area in which these grasses can be best used. Promising strains for specific areas: Nebraska 27—sand lovegrass, Nebraska 28—switchgrass, and Butte sideoats grama. Blue grama and big and little bluestem can be recommended for some sites.

OUR FUTURE FOOD SUPPLY depends upon the intelligence with which we use our productive resources. That is why an intensified, nationwide program of conservation—wise use of our land and resources—is so essential. While solving today's problems, we must not neglect tomorrow's needs.

EZRA TAFT BENSON,
Secretary of Agriculture

Beavers Do The Job

Beavers Create Farm Ponds in Soil Considered Unsuitable for Man-made Ponds.

By E. WAYNE BRENN

IF Richard Hollister named his farm, in south Logan County, Kans., according to the view from his farmstead, he would probably call it "Pleasant Valley."

This name well describes what one sees looking down over a grass carpeted, tree-lined draw. But Hollister is quick to tell you that the view has not always been so pleasant. In fact, a great change has come about during the last 5 years. To anyone familiar with this area, the change is remarkable because these years include some of the driest on record in this locality.

What is the reason for this change? Hollister is ready with the answer when this question is asked. He will point out several clear, grass-lined ponds and say, "This is the work of my private engineers—the beavers."

The view is nice, but to Hollister, a practical-minded cattleman, the most important value of the ponds is the water supply that has been developed for his livestock. It is not uncommon in this vicinity to haul water for both household and livestock use since good water wells are hard to find.

In the summer of 1952, Mr. Hollister, a cooperator of the Logan County Soil Conservation District, requested help to find a location for a stockwater pond toward the north side of his pasture.

The watershed, that Soil Conservation Service technicians found, varied little from others in this area, except that cottonwood and willow trees grew in the draw from just below the farmstead to the upper reaches in the south.

Closer inspection showed several seep spots in the area where the trees were growing.

Note:—The author is work unit conservationist, Soil Conservation Service, Oakley, Kans.

Below the last seep by the farmstead, Hollister had constructed a small dam across the gully in the bottom of the draw to impound 3 or 4 feet of water. It was evident that almost every shower overtopped and damaged it severely. Maintenance was a continuous problem. From this dam north, the watercourse was dry.

Foundation investigations at the only suitable dam site in the north pasture showed deep gravelly, alluvial fill in the bottom of the draw. The estimated cost to construct an impervious core wall, to cut off underflow through the porous strata, was too high for Hollister, so he decided to abandon the project.

As the party of owner, contractor, and technicians assembled at the site broke up, someone suggested in jest that, "what this draw needs is a few beavers to build a string of dams and do maintenance after every rain."

The idea of beaver dams stayed with Hollister. In the fall of 1952, he obtained 3 beavers from the Kansas Forestry, Fish, and Game Commission and turned them loose by the small dam. Since then, the beavers have increased to 10. To date, they have built 12 ponds at different points, stretching about a half-mile north from the farmstead, thus giving a pretty good distribution of livestock water.

The small dams have raised the water table along the stream, and as a result, the bottom areas are covered with a lush growth of grass, wild flowers, willow, and cottonwood trees. With this rapid growth of plants, the area is developing into an ideal wildlife habitat. Hollister's son, Dick, says he is catching some nice pan fish from some of the ponds, as well as having good duck hunting in the fall.

Hollister advises that anyone interested in starting a project such as this should first familiarize himself with the habits of beavers. He believes that the most important thing of all is to have a good supply of food available because the beavers will move on if food becomes scarce.

Contrary to popular belief, beavers do not spend the winter sleeping, so they must have

A series of three closely spaced beaver ponds on the Hollister Ranch.

food the year around. During the autumn months, they gather green twigs and branches of willow and poplar and store them at the bottom of the pond in which their den is located. As they need food during the winter, they leave the den through an underwater exit and swim to the food supply below the ice.

In this region, it may be necessary to plant trees to maintain a continuous supply of food. It may also be necessary to protect some of the larger trees that should not be destroyed. Beavers are ambitious and will start gnawing on trees whether or not they are 2 inches or 2 feet in diameter. Some large trees on the Hollister farm are protected by wrapping the base with heavy hail screen.

Dick Hollister has operated his 2,320-acre farm since 1937. It is a full-time job managing 1,914 acres of grassland along with 406 acres of cropland, 220 acres of which is under pump irrigation. However, he realizes the beavers are giving him a much needed service and is willing to go to considerable effort to keep them working for him.

Hollister also makes other good conservation farming methods a part of his farming system. He says that his terraces and contour farming on cropland, along with good grassland management on his pastures, are paying dividends every year.

Dick Hollister ready for a duck hunt at one of his beaver ponds.

Multiflora Fences—

A Haven For Wildlife

By JERRY KRIEGER

MULTIFLORA rose fences, touted for their value as wildlife food and cover, got one of the best tests of their real value to wildlife during the 7 consecutive weeks that snow blanketed the ground of Berrien County, Mich., through January and February 1958.

And if the experiences of three Berrien County farmers with these "living fences" are typical, the multiflora rose is indeed a haven and blessing to wild creatures in the depths of winter.

Clarence Wirth of Three Oaks, who planted one of the earliest multiflora rose fences set out in Michigan, related how an immense flock of robins swarmed to three stretches of multiflora fence on his farm.

The flock finally built up to where Wirth thinks there were as many as 500 robins living on the red seed hips or berries. He and his son counted 70 cedar waxwings feeding there, too, in one flock. Eventually, the swarms of birds cleaned up the seed hips and the robins moved on.

In addition to some cardinals, mourning doves, and several other species of small birds, a couple of coveys of quail and a number of pheasants were daily visitors to the multiflora fences all through the stormy seige. Rabbits, too, ordinarily inhabit these fences, Wirth mentioned, although he did not pay any particular attention to what use they made of the fences during the long stretch of snow cover.

Robert Lyttle, who has about 240 rods of multiflora fence on his farm at the edge of Buchanan, told much the same story.

And Andrew Zech, Berrien Springs dairy farmer, who could watch the activity along much of his 1,000 feet of multiflora hedge from the windows of his home declared: "A multi-

Note:—The author is farm editor of the *News-Palladium*, Benton Harbor, Mich., and the *Herald-Press*, St. Joseph, Mich.

Andrew Zech near one of his multiflora rose hedges.

flora fence can't be beat for wildilfe in such weather."

A flock of about 300 robins built up to feed on the small seed-bearing berries along Lyttle's fence. They stayed about 3 weeks until the berries gave out. Cedar waxwings and other species of birds, he couldn't identify, also were drawn to the lifesaving supply of food. Several coveys of quail worked the hedges constantly and Lyttle noted pheasants at various times. Whether rabbits fed on the seed hips, Lyttle did not see, but he said rabbits are to be found along his fence all year long.

Not only does multiflora rose serve as a life-saver when all other food supplies are covered, but Lyttle said his fence has proven a great magnet for summer birds.

"The bird population here is 10 times as great as it used to be before I planted the fence."

Zech and his family enjoyed the long seige of snow if for no other reason than the good view they had from their home of the comings and goings of about 50 pheasants, several coveys of quail, and a varied assortment of small birds that plied their multiflora fence for food.

Questioned about some vague reports that multiflora rose tends to spread into fields where it is unwanted, all three men said they had found no particular difficulty with the plant spreading.

Wirth and Lyttle noted, too, that a multiflora fence does not reduce the growth of crops planted beside them. To the contrary, both said they have seen some of their best corn rows and largest wheat yields right next to the fences. Lyttle offered the explanation that the hedge traps a great deal of snow and creates an extra supply of moisture in the soil close along the fence. The roots of multiflora do not spread out to the sides, as other plants might, but are confined largely beneath the plants.

A GOOD TURN.—A New England culvert company recently received an order for farm pond pipe from a farmer of Brimfield, Mass. The company didn't know exactly what the farmer's needs were. It didn't want to saddle him with pipe he didn't need.

So the company referred the farmer's order to the Soil Conservation Service office in West Springfield. On behalf of the Hampden Soil Conservation District, an SCS technician called on the farmer. The farmer had thought of tapping a brook as a source of water for his pond. The technician suggested a bypass dug-out pond. The farmer accepted the suggestion. He dug an 8 foot deep, 70 by 70 foot pond. Now it's full. Tapping the brook wasn't needed. Neither was the pipe!

—HERMAN GOODELL

WEEDING HORTICULTURAL CROPS

No. 34

This is the thirty-fourth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By L. L. DANIELSON

EVERY phase of agriculture is benefiting directly or indirectly from new methods of weed control now available for practical field use. Growers of horticultural crops such as vegetables, fruits, nuts, and ornamentals are receiving a large share of these benefits because of the many serious weed problems in these crops.

Vegetable crops are grown on approximately 5.2 million acres and have a total annual gross value of about 1.4 billion dollars. A conservative estimate of the cost of weeds to the growers of these crops would be about 17 percent of their gross value, or an average of about 238 million dollars each year. Data on the acreages and values of the other horticultural crops are not as well documented, but the information available indicates that the losses due to weeds may be much higher in some of the small fruit and nursery crops. These high losses and the scarcity of hand labor have created critical economic problems in the production of many of these crops.

Losses caused by weeds are assessed on the basis of the cost of control, the loss of crop yield and quality due to weed competition, and damage to soil structure and other soil properties due to repeated cultivations.

The benefits of weed control take many forms in the different types of crops. For example, in seed production effective weed control in the field greatly reduces the cost of cleaning operations. Control of thistles in cannery peas eliminates the problem of separating the thistle buds from the peas in processing. The dissemination of weeds with nursery plants—a source of customer dissatisfaction—might be avoided. These are representative examples of the many benefits that may result from effective weed control.

Chemical methods of weed control are now available for a number of horticultural crops. Reference to a few of these herbicides and their uses will demonstrate the effectiveness of the weed control research program, to date,

Note:—The author is plant physiologist, crops research division, Agricultural Research Service, Beltsville, Md.

Spinach sprayed with herbicide immediately after planting in the two center beds. Outside beds are untreated: weeds are mainly chickweed and henbit.

Lima beans with pre-emergence spray of DNBP (right). Untreated plot (left).

and its promise for the future.

Orchard and vineyard weeds are often a harbor for insects, disease, and rodents, and as such they have been controlled with intensive cultivation until recently. Repeated cultivations, close to the trees and vines, however, caused severe damage to the roots of the crops, and in addition contributed materially to soil and fertility losses by erosion. Herbicides may now be used in place of cultivation for a number of the weed problems in these crops. DNBP (4,6-dinitro ortho secondary butylphenol) combined with oil, or combined with oil and CIPC [isopropyl N-(3-chlorophenyl) carbamate] controls many annual grasses and annual broadleaved weeds in vineyards and orchards.

The intensive cropping methods used in woody ornamental nurseries necessitates the careful control of weeds. In the past, extensive hand weeding and cultivation were required. Newly rooted cuttings may now be planted in soil previously treated with methyl bromide, and remain relatively weed free for an entire growing season.

Weeds in established nursery plantings of certain woody ornamentals can be controlled with CIPC or DNBP, separately or in combination, in granular form without injury to the crop. Species differ somewhat in their tolerance to these herbicides, and research data on this subject are being accumulated.

Ornamental bulb crops, such as gladioli, narcissi, tulips, lilies, and irises have presented particularly difficult weed problems, in connection with bulb or corm increase plantings, where small bulbs, cormels, or scales are planted, because they emerge simultaneously with annual grass seedlings. Pre-emergence applications of DNBP combined with post-emergence treatments with sesone have proved effective in controlling many of the annual grasses and broadleaved weeds in these crops.

Annual grasses and annual broadleaved weeds in blackberries and raspberries can be controlled with a combination of applications of DNBP, CIPC, or sesone (2,4-dichlorophenoxyethyl sulfate). DNBP and CIPC are used during the dormant period. Sesone applications are made during the growing season to kill the weeds as they germinate, and before they emerge.

Weed control in strawberries became an economic problem of such proportions in recent years that the acreage of the crop was seriously reduced. Increased acreages have accompanied the development of new chemical methods of weed control. Chickweed, henbit, and other winter annual weeds are controlled with a combination of CIPC and sesone applied at the end of the growing season. Volunteer small

Cantaloupes with pre-emergence spray of NPA (right). Untreated plot (left).

Gladioli sprayed with sesone (above). Untreated plot of gladioli (below).

grain seedlings from mulches are also controlled. Summer applications of sesone, at monthly intervals, controls annual grasses, and controls a large percentage of the annual broadleaved weeds prevalent in this crop.

A brief sampling of the chemical weed control methods in commercial use on vegetable crops will indicate the promise of weed control research in these crops. The herbicides and methods described in the following discussion have given practical control of the weeds usually prevalent in the respective crops.

Pre-emergence and lay-by applications of sesone are effective in Irish potatoes. Post-transplanting and lay-by applications of NPI (N-1-naphthyl phthalimide) are useful in sweet potatoes. Pre-emergence applications of CIPC or CDEC (2-chloroallyl diethyldithiocarbamate), and a combination of the two, have proved useful on a number of leaf, salad, and cole crops. Sprays of Stoddard solvent may be used on growing carrots, parsely, dill, and fennel. Beans and sweet corn may be treated with pre-emergence applications of DNBP. Cucumbers, cantaloupe, and watermelons are tolerant to NPA (N-1-naphthyl phthalamic acid) as a pre-emergence application.

These practical weed control methods developed to date by Federal, State, and industrial scientists indicate the possibilities for weed control research in the future.

Siphon Better Than Flume

Wyoming Farmers Find It Profitable to Install an $8,000 Siphon to Replace a Flume in Their Irrigation Canal

By AUBREY STANTON

WATER problems of 75 farmers who irrigate 8,500 acres in the Riverton Valley Irrigation District in Wyoming have been solved by the installation of an $8,000 siphon in the main canal.

The new siphon replaces an old flume, which was installed nearly 50 years ago. The flume had seen its best days and was about to fall down. According to Pete Stone, ditch rider, a flash flood which came down Haymaker Draw last August would have washed out the old flume, if it had still been in use—but now, the water goes through the siphon. The irrigation

Note:—The author is work unit conservationist, Soil Conservation Service, Riverton, Wyo.

Installing the siphon tube across Haymaker Draw.

district was fortunate in getting the siphon installed before this flash flood came.

During the winter of 1956–57, the board of directors met with a Soil Conservation Service engineer to decide whether it would be better to install another flume or a siphon. They decided a siphon would be better because floodwater coming down the draw would not be so apt to wash out a siphon as it would a flume. Too, there would be far less maintenance cost on a siphon. Designs were drawn and costs figured on both steel and concrete siphons. The directors decided a steel siphon, with concrete inlets and outlets, would be better.

Soil Conservation Service engineers designed the siphon. First step was to make a detailed survey. From this survey, the steel pipe for the siphon was designed, and the SCS engineers furnished plans for the inlet and outlet structures.

Construction began with excavation of the trench in which to lay the pipe. A dragline contractor did the excavation, placed the pipe, and did the backfilling. Each section of pipe weighed around 7,000 pounds. This was a lot of weight for the dragline to pick up and carry, and then lower in place. At times the dragline would tip up to the front portion of its tracks, but the pipe was put in place with right alignment and grade.

Removing trash from the inlet to the Haymaker siphon.

Pouring concrete for outlet structure for Haymaker siphon.

As the sections of pipe were placed, they were joined with dresser couplings to make the joints watertight.

After the pipe was placed and covered, work began on the inlet and outlet structures. About 31 cubic yards of concrete were used to pour the inlet and outlet structures.

Pete Stone, the ditch rider who had the big job of supervising installation of the siphon says: "The old flume was loaded when the ditch was full of water. It even ran over in a place or two. The siphon will pack twice as much water as the old flume."

Buttonclover In Tennessee

By C. H. JENT, JR.

IT is indeed a rare occasion for farmers and agricultural workers to find a wild plant with the versatile qualities of buttonclover. But, that is exactly what happened—buttonclover (Medicago orbicularis) was found growing wild near Lebanon, Tenn., in 1936. How it traveled from its native home in Europe to this location is apparently unknown. But there it was—growing and thriving—as if inviting someone to use it.

From this humble beginning, buttonclover has spread and is now used in many parts of the country. Observational plantings made by soil conservation district cooperators have encouraged this wider use of the plant. (Seed for many of the plantings was supplied by the Soil Conservation Service.) Hundreds of Tennessee farmers are presently using this winter legume in their farming programs.

Results of extensive research conducted by the Tennessee experiment stations along with farmer experience have pointed up many uses for buttonclover. And, who knows, perhaps we are overlooking other uses for this plant.

A dependable volunteering habit, after its crop has matured seed, enhances its value as a winter cover and green-manure crop. The thick mat of viney growth furnishes excellent ground cover for erosion control. Also, research results show that it provides one-third more vegetative matter to turn under than crimson clover and one-half more than vetch.

This legume is used in short rotations on cropland, sometimes in contour strips. Jerry Bratton, a cooperating farmer of the Hickman County Soil Conservation District, uses buttonclover in a 2-year contour strip rotation. The entire field is in clover each winter with every other strip plowed under for corn in the spring. A cash crop of seed is harvested from the remaining buttonclover strips. The corn strips are moved each year. This allows the clover to mature seed every other year and keeps a good stand volunteering back.

This same rotation is used in entire fields. W. B. Allen, Montgomery County farmer, grows his corn and tobacco in this cropping system. J. D. Fuller of Stewart County also uses this rotation on his burley tobacco land. A volunteering cover crop, leguminous green manure crop, plus a cash crop of seed are the principal qualities of this rotation.

Sheep, cattle, and hogs all relish buttonclover pasture. The Currey brothers and Allen Sloan, farmers in the Maury County Soil Conservation District, use the plant for supplemental winter and spring pasture. E. J. Chapman, superintendent of the Middle Tennessee Agricultural Experiment Station, provides buttonclover pasture for the experimental flock of sheep kept at the station.

"Buttonclover on the rocks" is the way William Hawks and Henry Denny of Wilson County use the plant. Many acres in the Central Basin of middle Tennessee are shallow limestone gladeland. Buttonclover will grow

Volunteer crop of buttonclover in a corn field in Montgomery, SCD, Tennessee.

Note:—The author is management agronomist, Soil Conservation Service, Columbia, Tenn.

Dairy cattle graze a buttonclover-oats pasture in the spring. The 10 acres of this pasture provided 812 cow days of grazing during April and May.

and reseed on this type of land when once established. The period of growth coincides with the season when there is ample moisture available.

As a winter legume in common bermudagrass pastures, buttonclover provides excellent spring forage as well as some nitrogen for the bermudagrass. C. P. Moore in Van Buren County has had the clover reseeding for 9 successive years in a bermudagrass pasture.

To get reseeding in bermudagrass or other perennial sods, some grazing must be done in summer months after the clover matures seed. This helps to get seed distributed and in contact with the soil so they can germinate.

On good level land, buttonclover and sudangrass or Starr millet work together to give supplemental winter and summer pasture. For most successful management two fields are used, or one field is divided so an early and late seeding of the summer pasture can be made. This allows clover to mature seed on land where late seeding is made. By alternating early and late seedings, the clover matures seed on all the land every 2 years. This keeps it coming back without use of any additional seed. Also, it encourages better grazing management for the sudan or millet.

Tommy Lowe, Wilson County dairy farmer, uses buttonclover and oats for silage. Lowe says that his dairy herd seems to accept the silage and produces as well on this as on alfalfa silage. Yields of from 8 to 15 tons of silage per acre have been reported.

This legume is used for hay, but it is rather difficult to cure properly. The addition of one of the small grains helps overcome this difficulty if the clover is to be cut for hay.

These are some of the ways buttonclover is being used in forage programs and cropping systems in Tennessee. Although this legume is not a "cure-all" or a "wonder plant", it does definitely have a place on many farms in its area of adaptation.

Winter cover crop of buttonclover in a cotton field.

Better Grazing

The Grass Got Better While Ranch Profits Increased When Soil, Water and Range Conservation Measures Were Adopted.

By TOMMY ELDER and HAROLD GOULD

TWO drouths—along with tips he picked up in between—taught Oklahoma rancher Dwight Ferguson some things about grass that have paid him well.

There are things he is sure it would be handy and profitable for other ranchers to know. For example, information about fencing and stock watering places, and rotating the use of pastures. And, how much grass can be used and still have it in condition for good use of a shower, when it comes.

The Ferguson place is in northwest Oklahoma, in the Woodward County Soil Conservation District.

Ferguson and his foreman, Cecil Bishop, shrug a little on remembering the drouth of the 1930's.

"It almost put us out of business," the rancher said. "We were long on cattle—like most of the other ranchers in the neighborhood—and short on grass. It was a day-to-day fight getting enough grass and feed to keep them."

They held on to as many cattle as they could, always hoping that the next year would bring more rain and grass.

"We were thinking in terms of numbers of cattle to make our recovery," Ferguson said. "We were figuring wrong. When the good years came, our comeback was slow. We never seemed to have enough grass. Even during World War II, when cattle prices and rainfall were both up, we still were not getting the returns we could reasonably expect. We started looking for some answers."

By comparison, the drouth years of 1952-56 were as rugged as any of the previous drouth in Ferguson's section. The ranch got only two-thirds of its normal rainfall. But other things were different this time.

"We had plenty of grass for our cattle," Ferguson reports with satisfaction. "We harvested grass seed every year and were ready for the next year of good rainfall.

Note:—The authors are area conservationist and work unit conservationist, respectively, of the Soil Conservation Service, Woodward, Okla.

Cattle grazing on bluestem, switchgrass, and Indiangrass pasture on the Ferguson ranch.

"The good rains came last year, in 1957, almost twice the normal. Our grass was ready for it. We harvested a bumper crop of grass seed, including 55,658 pounds of mixed grasses and 41,095 pounds of pure switchgrass. This came from 1,500 acres of range we had rested."

Ferguson says a decision he reached in 1947 was an important one in his ranching program. This was when he went to his soil conservation district for advice.

The district board of supervisors assigned a range conservationist from the Soil Conservation Service staff at Woodward to see what might be done. The SCS man helped make an inventory of the ranch resources along with an analysis of range-management practices being followed.

November scene on the Ferguson ranch. The pasture at left was grazed during the summer: the one at right is ready for winter use.

The ranch of 5,400 acres was divided at that time into 2 large pastures. The inventory showed there were high-producing bottomlands, relatively low-producing uplands, and overused areas along with underused areas—all in the same pastures.

Immediate recommendations were for 4 miles of cross-fencing, 3 windmills, and a temporary decrease in the number of breeding cows.

"We were hesitant at first about the fencing," Ferguson admitted. "It seemed this might be expensive in proportion to results. To our surprise this not only improved our grass production, but we figure the added convenience in handling our cattle paid for the fencing the first year."

Combines, operated by the soil conservation district, harvest native grass seed on the Ferguson ranch.

They later added 4 miles more of fencing, 4 other windmills, overseeded 263 acres of poor condition areas with native grasses, and seeded 137 acres of cropland to grass. They set out to control brush on 1,940 acres, and began resting parts of the range each year and using them for winter grazing.

By 1950, results were showing. Tall grasses such as sand bluestem, Indiangrass, switchgrass, and little bluestem began showing up in abundance. They began harvesting grass seed, a revenue source every year since. In fact,

Grass seed from the Ferguson ranch being sacked and weighed in the soil conservation district warehouse.

Ferguson reports the grass seed harvested has paid the expense of improvements. (The harvest for 1957 prorated to the entire 5,400 acres, meant an income from that source of $10 an acre.)

But without the grass seed, the results still would have been satisfactory to Ferguson and Bishop. Since 1947, they have increased the cowherd by one-third, or a total of 300 head. Most years they have more grass than they can use, and they have been able to carry part of the calves until the year following to collect added profit. Several times they have been able to buy and winter around 500 additional steers.

Another thing has been pleasing to Ferguson. Wildlife has done much better on the place. Quail have nearly always been plentiful but now there are wild turkey, too. And deer, prairie chicken, and pheasant are showing up in greater numbers.

Ferguson sums up what they have done this way:

"We have the emphasis here now on getting the land, with soil and moisture conservation, to produce its maximum of grass. We have adjusted our cattle numbers to correspond. This way you can stay in the cattle business. Any other way, it would be mighty doubtful, friend. Mighty doubtful!"

Ditch Lining Was The Answer

Wyoming Farmers Use a Homemade Slipform for Lining Irrigation Ditches With Concrete.

By GEORGE E. GOBLE

THE serious problem of delivering water to crops through seepy, rodent-infested irrigation ditches is being solved by soil conservation districts in the irrgated valleys of southeastern Wyomng.

Concrete ditch lining was the answer for these ditches; but, getting the lining into the ditch easily and economically presented problems.

Fred Sieck, typical irrigation farmer of Goshen County and board chairman of the Lingle-Ft. Laramie Soil Conservation District, puts it this way: "For years, all of us knew what should be done. We just didn't know how to do it."

It was true that Sieck and many of his neighbors had been carrying on a ditch lining program, with varying degrees of success for some time. They had learned that concrete lining was apparently the best method they could use to eliminate erosion and ditch maintenance costs, while conserving irrigation water and speeding its delivery to crops.

Prior to 1955, however, methods of installation varied considerably, and costs were excessive. The lining itself ranged from plastering the ditch with a thin membrane of concrete that lasted only a few years, to using elaborate portable forms and hand troweling it for the desired finish.

In many cases, satisfactory results were obtained. But, one serious disadvantage was always present; a lot of time, money, and hand labor was required to produce an acceptable job. This was true even in recent years when most of the concrete was delivered to the ditch by ready-mix concrete companies.

Sieck probably echoed the sentiments of all the irrigators in the area when he remarked that everyone was handicapped in using "horse and buggy" construction methods to produce a "jet propelled" irrigation system. The installation of more than 5,000 linear feet of lining, in the head ditches of his own farm, certainly qualified him to evaluate the practice. His proven records of 25 to 50 percent more available water for crops, as well as the elmination of ditch maintenance costs and rodent damage "sold" not only himself, but also most of his neighbors on the value of concrete lining. However, these antiquated construction methods and high initial costs generally discouraged a widespread acceptance of the practice.

By 1955, irrigation water shortages were becoming a serious problem in the area. It was evident that the lining program must be accelerated.

In several irrigated areas of the West, steel

Note:—The author is work unit conservationist, Soil Conservation Service, Lingle, Wyo.

Loading slipform hopper with ready-mixed concrete prior to installation of concrete ditch lining.

slipforms for the placement of lining in supply canals had been used with success. These were mostly expensive machines that were contractor owned and operated, and probably they would be too costly for an individual farmer to use in his own laterals. Could a smaller, less expensive version of the form be constructed? It would have to be a slipform that could be transported easily from farm to farm. An ordinary farm tractor would have to be capable of pulling it through the ditch. The crew needed for operating the form would necessarily have to be supplied by the farmers themselves.

Early in 1955, the North Platte Valley Soil Conservation District, one of three operating in Goshen County, decided that the possible gains of constructing a slipform were worth the gamble. With the aid of Soil Conservation Service technicians assigned to the district, a moderately priced form was designed for use in average-sized field supply ditches in the area.

Constructed in a local machine shop, and put into use more or less experimentally that

Placing concrete lining in a ditch with a slipform. Carpenter's level on the right determines when the slipform is plumb.

spring, the slipform proved entirely satisfactory. Even though the machine was manned by inexperienced crews, and pulled by ordinary farm tractors, ditches could be lined as rapidly as concrete could be delivered by ready-mix trucks. Installation of more than 2,000 linear feet of lining per day was not unusual.

Fred Sieck and his fellow soil conservation district supervisors, as well as supervisors from the South Goshen Soil Conservation District, watched the progress with keen interest. North Platte Valley District's gamble paid off.

In an effort to start the lining program on a countywide basis, and speed up the operation, a meeting of all interested groups and agencies was held in the fall of 1955. The three local soil conservation districts agreed to build additional slipforms on a cooperative basis. Forms would then be available to meet practically any ditch-lining situation that might arise. The County Agricultural Stabilization and Conservation Committee agreed to adjust incentive payments to make the practice more attractive to irrigators. Local ready-mix concrete companies agreed to obtain additional trucks and equipment to handle the expected demand for concrete.

Fred Sieck trowels the freshly poured concrete to smooth out some rough spots.

A curing compound is applied with a hand sprayer to freshly poured concrete lining.

During the winter, County Agricultural Agent B. H. Trierweiler and local newspapers publicized the value of the practice. With spring came the expected demand by district cooperators for SCS technical assistance in the planning and establishment of concrete ditch lining.

The operation functioned smoothly, and by the winter of 1956, soil conservation district records showed that a total of almost 200,000 linear feet of lining had been installed in Goshen County.

During 1957, ditch-lining operations not only continued in Goshen County, but several other southeastern Wyoming counties also put slipforms into operation.

NEW ENGLAND THRIFT.—Oliva Lahna of Westboro, Mass., does not like to see anything wasted. His Northeast Worcester County Soil Conservation District farm plan called for building a dam-type pond. The pond would cover a wooded area. Lahna didn't want to waste those trees. So he hired a wood chipper and turned the trees into mulch for his strawberries.

—GAYLAND E. FOLLEY

DISTRICT PROFILE

LYLE DICKMAN of FLORIDA

LYLE DICKMAN is a husky, six-footer, who looks as if he might be a pro football player enjoying a Florida vacation.

Instead, he's one of Florida's leading vegetable farmers and a businessman of acumen and sharp judgment. He grows sweet corn, lettuce, and cauliflower, which he markets intact. Such leafy vegetables as cabbage, escarole, and endive he processes as slaw and salad, in his own plant on the farm, and markets throughout the Southeast. He also packages spinach, mustard, collards, and kale. He raises cattle, and he's one of the leading lemon producers in the Nation.

As if all that didn't take up enough of his time and energy, he serves as chairman of the board of soil conservation district supervisors in the Hillsborough Soil Conservation District. And recently, he was appointed by Governor Collins to serve on the State Soil Conservation Board. He was also recipient of the Governor's Conservation Award as outstanding soil conservationist in Florida in 1957.

Mr. Dickman is keenly interested in the work of the district, with an intelligent understanding of the whole broad field of soil and water conservation—especially water conservation. And, he possesses a driving urge to do something about it. He attends every district meeting in the Hillsborough District besides area, State, and national meetings.

A good speaker, he appears regularly on farm programs on Tampa radio and television stations to discuss district work. He lends encouragement and, if necessary, material assistance to anything that will further the work of the district, such as school essay contests, banker-farmer awards, land judging, and so on.

"There are 4,500 farmers in Hillsborough County," he pointed out, "and agriculture is still the backbone of our economy despite the phenomenal industrial growth that has taken place in Tampa and its environs.

"In view of this, it's simply good business to conserve soil and water resources—good business for the community as well as for individual farmers."

Lyle Dickman has one of the finest soil- and water-conservation programs on his farm that I have ever seen. His entire farm is operated under a soil conservation district plan; there isn't an acre on it that isn't completely protected by adequate conservation practices. As a matter of fact, it has been on maintenance for several years.

All his cultivated land is so ditched that it can be drained or irrigated with the same ditches. During the wet weather the ditches are used to drain off the excess water. During the dry season, water is fed into the ditches from artesian wells and the land watered by subsurface irrigation.

Other conservation practices that Mr. Dickman has established include windbreaks of Australian pine to protect his vegetable crops from blowing sand, and a long range grass-based rotation that he meticulously observes. After 6 to 7 years of producing vegetables, the fields are put in pangolagrass and used as pasture for 6 years.

Lyle Dickman displays some of his large lemons.

At the end of 6 years, Mr. Dickman turns under the grass in April or May, puts in an annual cover crop of sesbania or hairy indigo in June, and then in September, turns under the cover crop for vegetables. He then plants vegetables for another 6 or 7 years, or until the benefits of the perennial grass and cover crop have been expended.

"I cleared this land 15 years ago," he said. "At that time it was new land—had never been cultivated—and it made bumper crops. But today, it's better land than it was then, and will produce more than it would then, even with less fertilizer."

Lyle Dickman also owns the largest lemon grove in Florida, with 350 acres of trees. In 1957, he produced what he described as "a beautiful crop of good size and good weight." The lemons were as large as the average orange, and a box of 350 weighed 90 pounds.

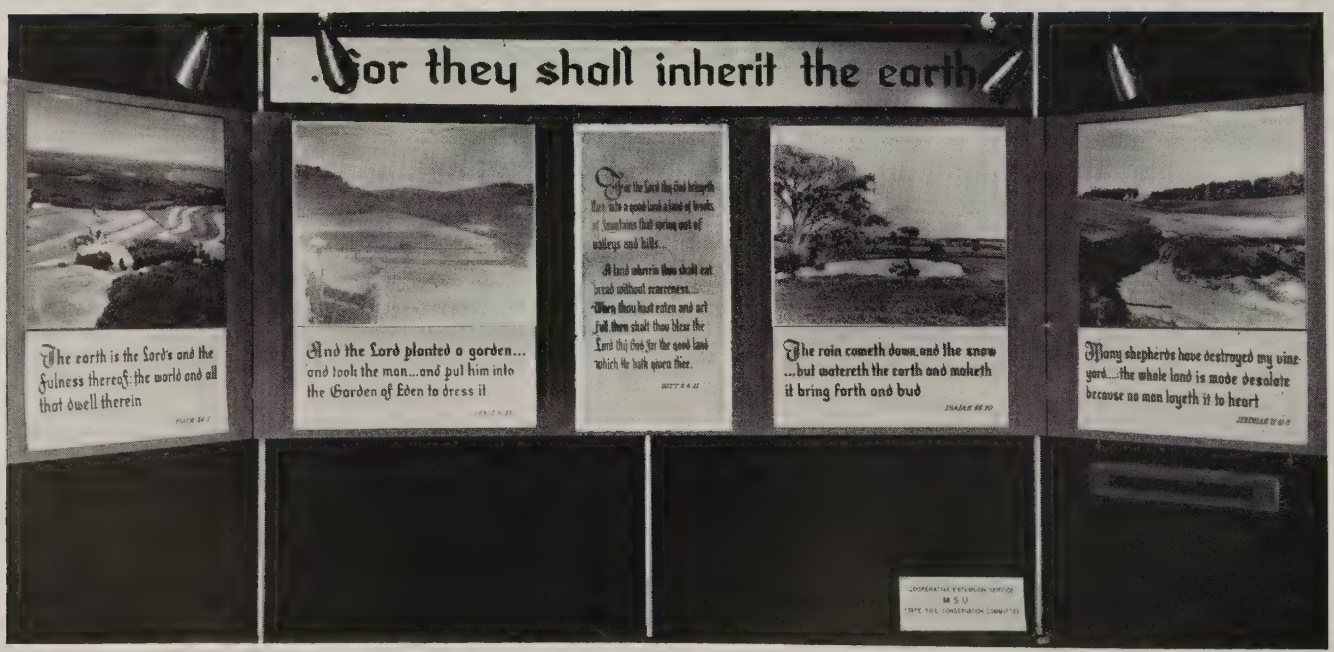
Another accomplishment that can be chalked up to Dickman's initiative and interest in public service is what is known on that part of the western coast as "The Tampa Bay Project." This involves converting that part of the Bay above the Courtney Campbell Causeway, connecting the cities of Tampa and Clearwater, into a freshwater lake.

This project had been discussed for a least 10 years but, until Dickman took hold of it and started the ball rolling, it was just a good subject for discussion at civic club meetings. Lyle Dickman got Governor Collins interested in the project and has kept the ball rolling since that time. Now the completion of the project is pretty much of a certainty.

Dickman is 37 years old, married, and the father of three sons. He is a graduate in agriculture of the University of Florida, class of 1942. Besides being chairman of the board of soil conservation district supervisors he also serves on the county ASC committee. He serves on those boards and committees because he feels that it is his duty to do so.

"It isn't enough for a farmer to conserve the soil on his own farm and stop with that," he says. "I feel that he has an obligation to work and to use his influence in obtaining the widespread application of conservation practices on all the land. Land is still our basic resource and, as long as it is, conservation will be of utmost importance."

—LEON J. SISK



CONSERVATION EXHIBIT.—This exhibit, displayed at 1958 Farmer's Week at Michigan State University is now available for use by county agents throughout the State.

DISTRICT PROFILE

TONY KREBS of SOUTH DAKOTA

THE conservation of soil and water plays a large role in the life of Tony Krebs of Quinn, S. Dak. He is not only an ardent conservationist on his own land, but devotes much time to conservation in his soil conservation district, in South Dakota, and in the Nation.

The control of wind erosion is of primary interest to Krebs. To accomplish this on his place, he uses a combination of stripcropping and stubble mulching. "Keeping the stubble on the top of the ground not only helps prevent wind erosion," says Krebs, "but it helps put more moisture in the ground and slows down evaporation." Of stripcropping he says, "Narrow strips of about 10 rods in width are needed on these highly erodible soils to do a satisfactory job of controlling wind erosion."

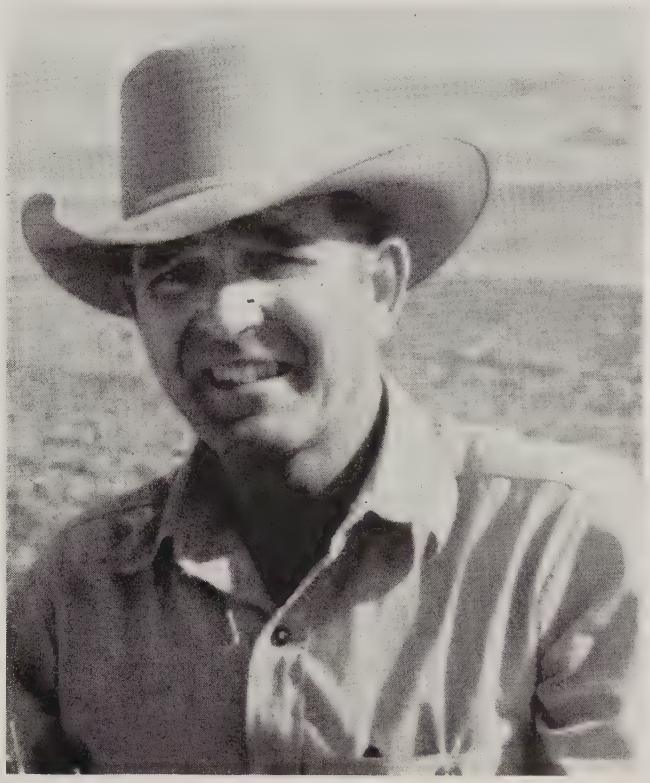
Tony is now starting a terrace system on one field and has plans for a small water-spreader system on some of his rangeland. He has recently established contour furrowing and pitting on 400 acres of rangeland and has planted about 7 acres of trees. Five acres have been planted in cooperation with the South Dakota Department of Game, Fish, and Parks for wildlife cover as well as for livestock protection. This planting will be expanded.

Krebs farms and grazes about 3,000 acres. He keeps about 100 head of Hereford cows as a breeding herd. In addition to the normal crops for his area, he raises grass seed for home use and market.

Range conservation is an important part of Krebs' operations and involves such practices as proper stocking and distribution of grazing with stockwater developments.

Tony won first place in his soil conservation district in the Greater South Dakota Association's Soil and Moisture Achievement Contest in 1956. The association paid his tuition for a short course in conservation at South Dakota State College as a result.

Krebs helped organize the Eastern Pennington Soil Conservation District in 1946, and has been chairman of its board of supervisors since its organization. He has been area vice president of the South Dakota Association of Soil Conservation Districts and a director of the National Association of Soil Conservation Districts. Recently he was elected as vice president for the National Association. His travels in these capacities cover the whole United States.



Tony Krebs.

Tony has an active partner in conservation. Mrs. Krebs is the Ladies Auxiliary treasurer of the South Dakota Association of Soil Conservation Districts. She also attends many meetings with Tony.

The Krebs are also active in many other community affairs. They both take an active part in the First Lutheran Church of Wall. Tony is president of the Pennington County Crop Improvement Association and vice president of the Golden West Telephone Association.

—KEITH HARNER

THEODORE ROOSEVELT, 1858-1958.—American conservationists, in 1958, honor this conservation-minded president on the centennial of his birth.

He fought the profiteers, land-grabbers, and wasters of the soil with much the same vigor he used in charging up San Juan Hill.

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"When the soil is gone, men must go, and the process does not take long." Even 50 years ago, our 26th president knew this, and tried to make sure, through law, that not only the land, but forests, water, and wildlife as well, would not be wasted—all would remain for future generations of the American public to enjoy.

He set aside more land—over 148 million acres, in our National Forests of today—than all other presidents combined. Due to his interest, a nationwide concern for conservation of forests, their management, and the beginning of the profession of forestry, came into being.

Today's National Park System and the National Monument Act were established during his administration, including Grand Canyon and Crater National Parks, and National Monuments, such as the Natural Bridge of Utah, and the Petrified Forest of Arizona.

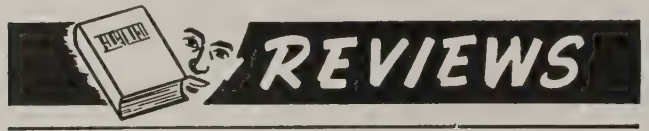
His influence half a century ago at the Federal level in conserving the wildlife of America is reflected today in the growing action taken by individual States in wildlife management and protection.

In 1902, he signed the Reclamation Act that launched government into helping handle land, irrigation water, and hydroelectric problems in the rapidly developing West.

Against wasteful practices he said, "What has thus happened in northern China, what has happened in Central Asia, in Palestine, in North Africa, in parts of the Mediterranean countries of Europe will surely happen in our country if we do not exercise that wise forethought which should be one of the chief marks of any people calling itself civilized."

Fifty years ago this was true; and, it is just as true today.

—RUTH A. FRIES



CROP PRODUCTION IN THE SOUTH. By Glenn C. Klingman. 416 pp. Illustrated. 1957. New York: John Wiley & Sons, Inc. $4.95.

THIS text is written in a very clear, concise manner. It is primarily for high school and vocational agricultural instructors in their adult class work.

Nine chapters are devoted to the production of the major agricultural crops grown in the South. Each chapter is rather complete in discussing the importance, adaptation, crop needs, control of major insects and diseases, and harvesting methods.

Forages for pasture, hay, and silage and their importance in the South is treated in sufficient detail to explain where and how they can be used. A chart in the chapter shows when the major forage plants grow and the recommended time of seeding.

The author has discussed the subjects of how plants grow and the relationship of plants to soil. These two chapters form a good background for understanding the reasons for doing certain jobs at certain times in the later chapters.

At the end of each chapter a list of review and study questions are included. Answers to some are found in the text. Others can be answered by knowing certain facts, then applying the facts to the problem.

—B. D. BLAKELY

WATER: Our Most Valuable Natural Resource. By Ivah Green. 96 pp. Illustrated. 1958. New York: Coward-McCann Inc. $3.50.

THIS is another excellent booklet on water—its use and conservation. It is well-illustrated and written in a style appropriate for reading by fifth grade students or college graduates. It fully meets the standards of the other books and booklets written by Ivah Green.

—TOM DALE

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1958

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EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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FARMERS AND SPORTSMEN.—As farmers learn how to use their land and real sportsmen lose their idea of slaughtering game wholesale, of cutting farmers' fences and leaving the gates open, the whole of Ohio or any State can become a sportsman's paradise and an area of clean streams and beautiful forests and rich, productive farms to be enjoyed not only by the prosperous farmers but by the city dwellers seeking escape and relaxation from the pressure and artificialities of nerve wracking cities.

—Malabar Farm
LOUIS BROMFIELD

WATERSHED PROTECTION AND WILDLIFE CONSERVATION.—We have in creek-size watershed protection projects some of the best opportunities we have ever had for improving the habitat for beneficial wildlife, including waterfowl.

D. A. WILLIAMS

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Farm windbreaks near Vernon, Tex., as seen from the air.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Big Business On A Small Farm

Conservation Planning, Hard Work, and Good Management Convert a 90-Acre, Run-down Farm into a Profitable Enterprise.

By MILFORD SCHMIDT

EVER wonder how to make a living on a small farm? One way is to get a part-time job in town.

But that solution didn't suit Mr. James Schey and his wife, Wava, of Hancock County, Ohio. They wanted to make their farm operation a full-time job. And they did just that, though it took some hard work and planning—soil conservation planning, that is.

Back in 1947, when the Scheys rented a 90-acre farm all they had was Jim's $400 Navy discharge pay, two sows, one cow, a one-plow tractor with cultivator, a disk, and an old hen with 13 chicks.

Today, they not only own the farm—they have tripled their farm income in the last 8 years. The one-cow dairy herd has increased to 19 with an average of 11,000 pounds of milk annually. (Jim plans to expand the herd to 30.) The one hen with 13 chicks has grown to 600 hens, and Mrs. Schey was awarded a trophy as a master egg producer by a local seed corn company. This award was presented for producing 255 eggs per hen in 11 months.

In 1954, the Junior Chamber of Commerce selected Jim as the oustanding "Young Farmer" of Hancock County. He got another trophy from the Hancock County Farmers Club. And in 1956 and 1957, he was honored at the soil conservation district's annual meeting by the Goodyear Tire and Rubber Co. as the outstanding farmer in the county.

"Our first year of farming was the wet year of 1947," Jim recalls. "Two fields, totaling 20 acres, were so wet I didn't get to plant them at all. My oats yielded 5 bushels per acre. (Last year Jim got 70.) The pastures were mostly wiregrass. Gullies were 2 to 3 feet deep. The farm was run down and sick.

Note:—The author is work unit conservationist, Soil Conservation Service, Findlay, Ohio.

The Scheys bought the farm in 1949 and immediately started working over the buildings, beginning with the barn.

"We had hot water in the barn before we had it in the house," Wava said.

In 1950, they learned about the Hancock County Soil Conservation District program and signed an application with the district for technical assistance. After the SCS soil scientist made a land capability map of the farm, I, as a farm planner, went over the farm with James. It was agreed that the land was better suited to dairy and poultry than to hogs. Both a conservation crop rotation of corn-grain and 3 years of meadow were developed.

Grass waterways were put in, tile drainage was installed, and fields were rearranged to fit a "More Grass More of the Time" rotation. Soil samples were collected and, when tested, showed a need for lime. The whole farm has been limed, some fields a second time.

A crop fertility and meadow improvement

Wava and James Schey receive conservation award from Roy Grubb of the Goodyear Tire and Rubber Company.

plan was outlined. These improved meadows stopped the gullies and sheet erosion. Each acre now receives 1,000 pounds of fertilizer per rotation.

The effect on crop yields was spectacular. The first year the hay crop barely covered the hay mow to a depth of 6 feet. Last year, Jim filled the barn and left one cutting in the field. With a 4-ton hay yield per acre, it was the first time he did not have to buy hay.

The Scheys in their gladioli field.

His corn yields have gone from 29 bushels in 1947 to 101 bushels. Wheat yields have jumped from 30 to 40; and, oats from 5 to 70.

The farm had a 9-acre woodlot, which Jim now protects from fire and grazing. He has cut out from the woodlot blue beech, iron wood, poison-ivy, grapevines, and cull trees. Now, he has a good stand of oak, ash, and maple.

A planting of 3,000 multiflora rose hedges forms a living fence around the woods and makes a wildlife haven. Jim said recently that he had seen more quail, pheasants, and rabbits on the farm the past season than he had seen in any previous 10-year period.

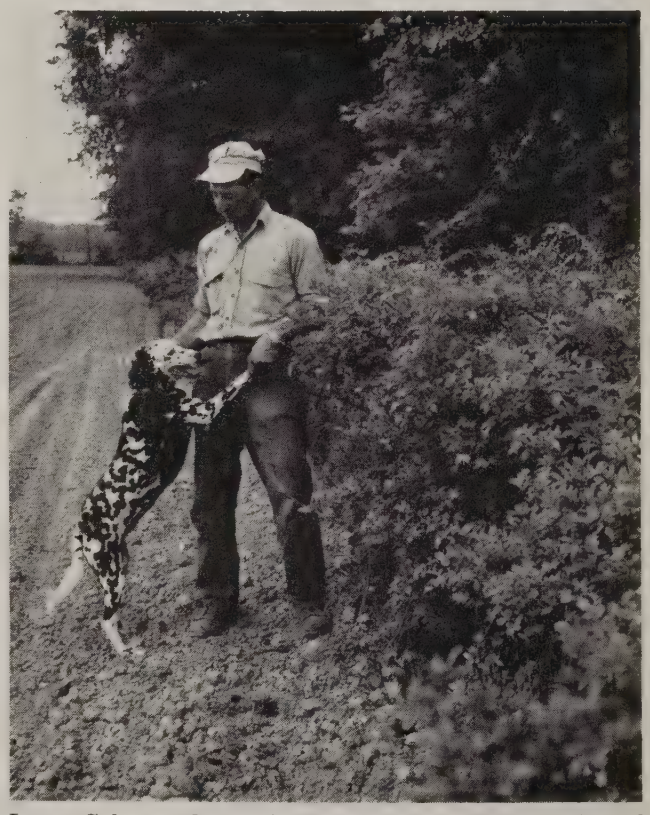
The timber cut from cull trees produced 15,000 board feet of lumber, which he used to build a 40- by 50-foot henhouse plus remodeling a large brooder house. With the help of the neighbors, Jim has made many more improvements, including a garage, shop, milking parlor, and finally, the modernizing of the house. "Without the neighbors' help in cutting trees, sawing logs, and putting up the buildings, it would have been an endless job for the two of us," he says.

In spite of all the work in building a big business from the small farm, Jim finds time to be an associate supervisor of his soil conservation district. He is a member of the local Dairy Service Unit, Northern Ohio Breeders Association, Farmers Club, the Dairy Herd Improvement Association, and an active church member.

Mrs. Schey represents her township on the County Home Demonstration Council. She is a member of the garden club, teaches a Sunday School class, and is on the troop council for the Brownie Scouts.

The Scheys have participated in the International Youth Exchange, and in 1952 they had as a guest Jerardo Tobon from Colombia, South America. Also, in 1955, Waldenar Rodriques from Brazil was in their home.

By intensifying the output on this small farm the Scheys have assured themselves of a full-time job—they will not need to worry over the need for off-the-farm work. With only 76 crop acres on the 90-acre farm, they have succeeded in turning it into a full-scale operation by making the best use of each acre.



James Schey and favorite dog near a border planting of multiflora rose.

LAND FORMING IN ALLUVIAL AREAS

No: 35

This is the thirty-fifth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By IRWIN L. SAVESON

MANY different terms, such as land leveling, land grading, land smoothing and land shaping have been used to designate the land forming operation. They all refer to the same general practice.

The primary purpose of forming land is to provide a uniform land surface that will facilitate an even movement of surface water. Most alluvial farm lands have sloughs, depressions, or other irregular surfaces due to unequal deposition of water-transported materials during times of flood. Another cause of irregular surfaces is the failure to smooth a field after tillage to remove scars made by farm implements.

Often the breaking and cultivating of farmland is done in the same direction season after season, leaving holes where implements enter the ground and piling up earth where they leave the ground. Inadequate disposition of spoil banks from ditch excavations has left many barriers, which cause ponding. The presence of ponded water on farmland after heavy rains indicates an unsmooth surface, which results in lowered crop production by impairing the surface drainage of the land.

Research studies conducted in the early 1940's in Louisiana demonstrated the relationship between water-ponding pockets and yields. Smooth fields, having no pockets, produced 4.59 more tons of cane per acre than land having surface ponding of 2 inches or more on 53 percent of the land. The pockets not only impair surface drainage of land but make it almost impossible to secure an even application of supplementary irrigation water.

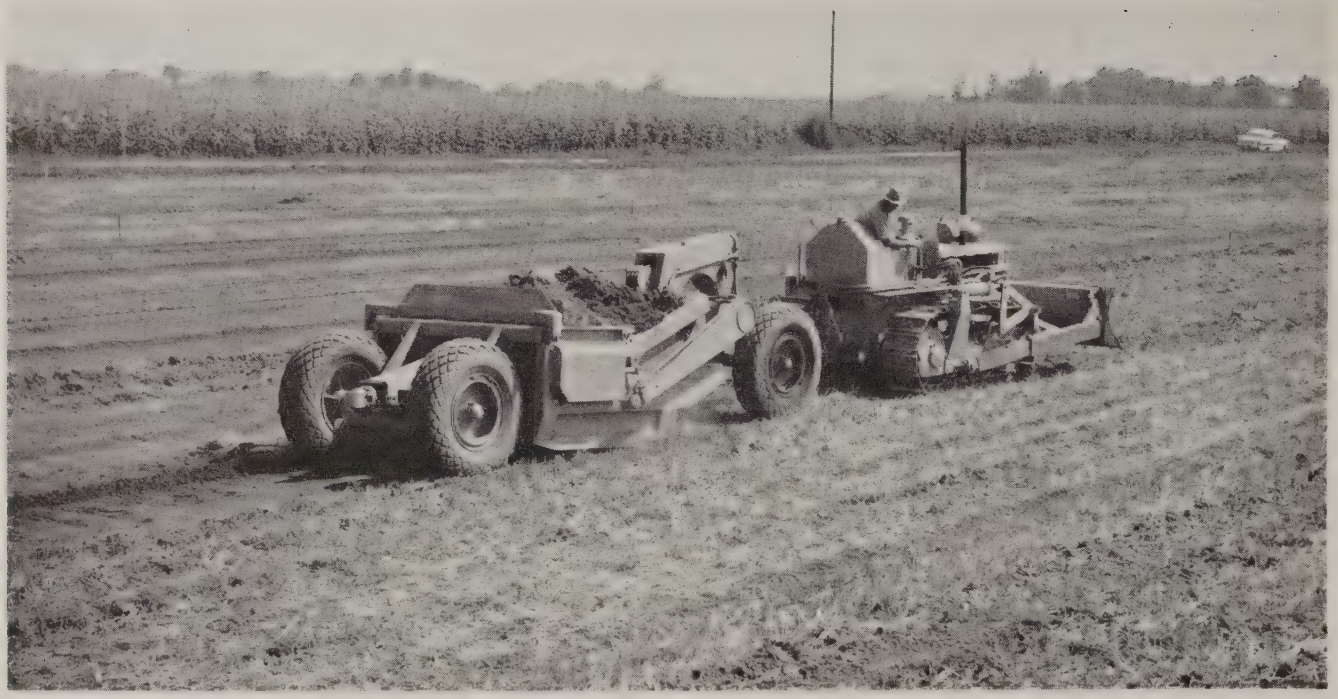
The practice of forming land was developed in the arid section of the United States to assist in the application of irrigation water. It is known in that section as "land leveling." This practice is moving to the humid section of the United States to assist both in the application of supplementary irrigation water and improvement of surface drainage. This twofold function of the practice applies to the alluvial areas of the South, and especially to the Mississippi River Valley sections of Arkansas, Louisiana, and Mississippi, which receive about 50 inches of rain per year. In many seasons the distribution of rainfall is not uniform. Planters have to provide drainage during periods of excess rainfall, and for maximum crop production, supplementary irrigation is needed during periods of inadequate rainfall.

Most of the land that is being formed in the alluvial section is primarily for row crops; however, some pasture land is being formed.

A recent reconnaissance survey made on five locations in Louisiana and two locations in Mississippi indicates that there are two general classes of alluvial land being formed: (1) Lands with ridges and sloughs, and (2) those having fairly uniform slopes. The ridge and slough lands have slopes of .1 ft. to 1 ft. per 100 ft., ranging in length up to three-fourths of a mile along the Mississippi and the bayous in Louisiana. In the Yazoo Basin in Mississippi the slopes range in length up to 3 miles. The uniform slopes in Louisiana and Mississippi range from .05 to .3 ft. per 100 ft., and range in length from 300 ft. to approximately 4 miles.

Agricultural workers have of necessity used the principles and techniques developed in the arid section of the United States in forming and

Note:—The author is project administrator, soil and water conservation research branch, Agricultural Research Service, Baton Rouge, La. This article is a condensation of a paper presented by the author at the Beltwide Cotton Mechanization Conference of the National Cotton Council of America, Shreveport, La., October 1957.



Pan-type, self loading scrapers are efficient for cutting off high spots and filling low places in land forming operations.

smoothing land, since there was little information available for the humid areas. But, due to climate, crops, topography, and soils they have found it necessary to modify western practices to meet conditions of the humid area.

The idle period for row cropland in Arkansas, Louisiana, and Mississippi is of short duration and is also the wet season of the year. This induces farmers to try to form the land when it is wet. In most instances this damages the land. Often the work is rushed and a poor job is the result. Experience has shown that it is more desirable to leave the land out of crop for a season, doing the forming during dry periods after adequate disposal of crop residues. Many farmers are forming their land when it is retired in the Soil Bank Program, others are forming their land after the oats are harvested in early summer.

Land forming operations in the humid section are complicated by the lush growth of vegetation. The first step in preparing land for forming is to dispose of crop residues. Much effort and machine time have been wasted in trying to form and smooth trashy land. The Delta Branch Experiment Station at Stoneville, Miss., reports an increased cost of $20 per acre for forming land under trashy conditions.

Crop residues are disposed of by plowing them under and allowing sufficient time for decomposition before starting the forming operations. In the meantime, volunteer vegetation is kept under control by disking.

Forming operations in disposing of trash and controlling vegetation leaves the earth in a fluffy condition. This must be considered in surveying and making the earth-moving calculations. The fluffy soil conditions lessen efficiency in many instances, as earth-moving equipment operates better on a firm soil than on a loosened soil. The area should be floated or dragged to remove implement scars and to firm the area as much as possible.

Most of the technical assistance in land forming is being given farmers by SCS technicians cooperating with soil conservation districts and the Extension Service; however, there are many private engineers doing this work in Mississippi. They are using a grid type survey with 100-ft. stations, reading their rods to a tolerance of .05 to .1 ft. The slope to which the area is to be graded in most instances is determined by using the "least squares" method. It has been found, however, that this method is not always applicable. This is especially true in non-rectangular areas, in which the slope is determined by aver-

age profiles and inspection methods.

Some engineers use a shrinkage factor when taking levels to overcome the problem of loosened earth due to disposal of crop residues. This shrinkage factor ranges from .01 to .12 ft. Other technicians have increased the cut and fill ratio to 150 percent to compensate for this loosened condition. Those who are using the shrinkage factor figure their cut and fill in most instances on a 60-40 basis.

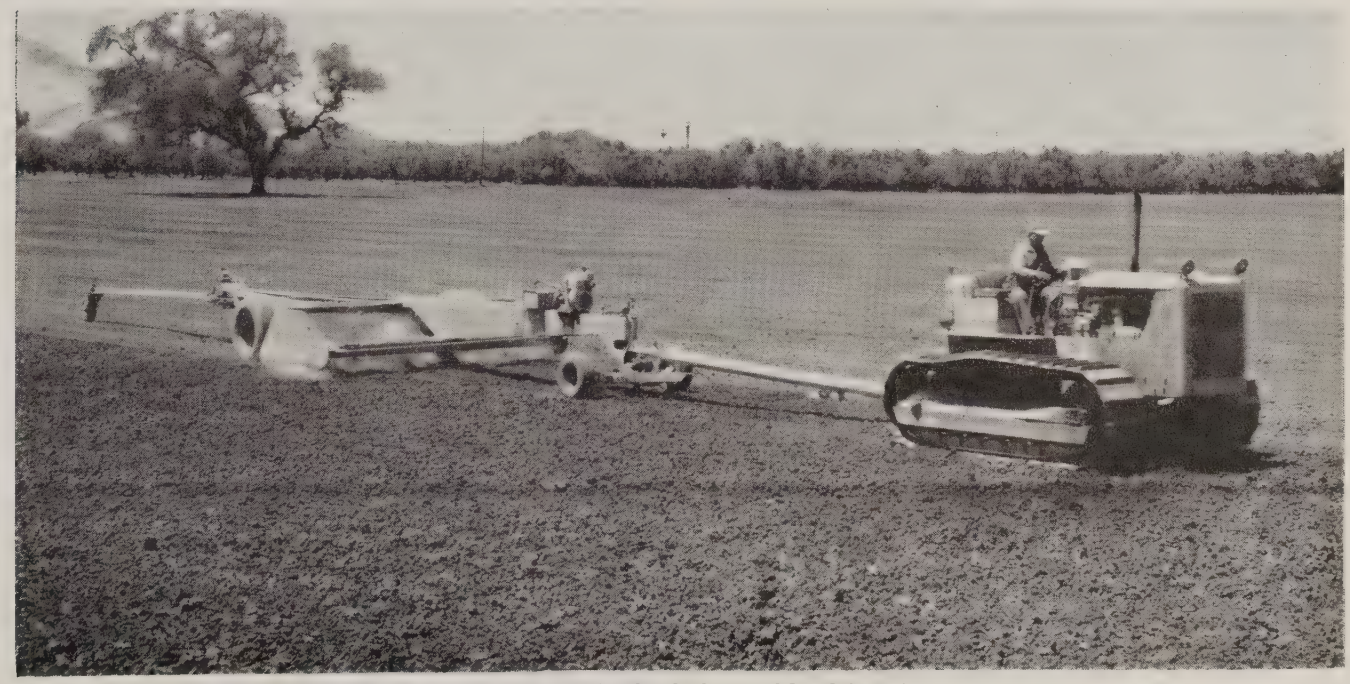
Most areas are being formed with a slope of .1 to .2 ft. per 100 ft. In some localities the areas are being formed without any sidefall. Most of the fields formed with a sidefall are in the ridge and slough areas. The maximum cuts are approximately 1.5 ft. and the sidefalls average from .3 to .5 ft. per 100 ft. Fills run approximately the same.

On the regular slopes in Louisiana and Mississippi the maximum haul distance is about 1,000 ft., with an average of 400 to 500 ft. In the ridge and slough area of the Yazoo Basin the maximum haul distance is 1,500 ft., with an average of approximately 600 ft. The maximum amount of dirt moved per acre on the uniform slopes is approximately 500 cubic yards, with an average of approximately 300 yards per acre. In the ridge and slough area of the Yazoo Basin the maximum yardage is approximately 500, with an average of approximately 350 yards per acre.

The tolerance allowed for forming work varies somewhat between Louisiana and Mississippi. Louisiana is allowing .1 ft. per 100 ft. tolerance for rough farming work and no tolerance for finished work. In Mississippi .1 ft. per 100 ft. tolerance is allowed on the finished work. The work is being done mainly by farmers with self-loading scrapers and wheel-type tractors, both in Louisiana and Mississippi.

Many soil conservation districts in Louisiana are supplying equipment for land forming work. A few contractors are also doing land forming work in Louisiana and Mississippi, using both self-loading scrapers and pan-type scrapers with crawler tractors. Most of the land levelers being used to finish the work have a length of about 30 ft.

In the Delta section soil moisture and texture are not uniform, complicating the earth-moving operation. In the cut areas, scrapers are difficult to hold, in many instances they over-cut, which necessitates refilling the area. The moist areas are rubbery. In the smoothing operation the land levelers with cross blades often only depress the high points without removing them, leaving a knoll which interferes with the movement of water. There is need for some machine



A field plane is used for the final phase of land farming operations.

development work to correct this situation.

In the seven locations of Louisiana and Mississippi, where the reconnaissance survey was made, the lack of experienced operators was reported as being the greatest problem. This is understandable since this is a new practice and experienced operators have not been developed. Furthermore, the work requires individuals with a very good conception of grade, because the areas are being formed to a very slight grade of .1 to .2 ft. per 100 ft. This lack of experienced operators also increases the work load of the technicians having to check and recheck the work, limiting the amount of land forming that can be laid out and checked.

Costs of moving the earth at these seven work locations ranged from 22 cents to 30 cents per cubic yard, with the higher costs being on areas having light cuts and fills. The cost per acre ranges from $55 to $120 per acre; the average cost is $60 to $75 per acre.

Most farmers are subsoiling the areas after forming to release the compaction of the earth-moving machines. This is desirable since tests in Louisiana show that land forming equipment, especially land levelers, compact the soil approximately 6 lbs. per cu. ft. A heavy field cultivator with flexible chisel shanks is a good tool for this operation because it blends the original soil with the fill material.

Some farmers have taken steps to gear their tillage practices to formed land. They have purchased two-way plows in order to maintain the generally formed slopes and are floating the fields before each planting. Other farmers are disking and row-breaking. A number of them have not given this phase much consideration, however, and are tilling their fields in the original conventional manner, which will eventually lessen the effectiveness of the forming work.

From the Agricultural Conservation Program records of Louisiana and Arkansas and the SCS records of Mississippi, the following land forming work had been done by the fall of 1957, with the various agencies' assistance:

Arkansas—Irrigation, 28,133 acres; Drainage, 24,084 acres.

Louisiana—Irrigation, 408,764 acres; Drainage, 11,799 acres.

Mississippi—Irrigation and Drainage, 54,254 acres.

Most farmers accept the fact that good drainage is essential in securing an adequate stand of cotton, and generally, the poor stands on farms reflect inadequate drainage. In 1957, which was a wet year, visual observations in Louisiana and Mississippi showed a good stand of cotton and a more uniform growth, even on "buckshot" land, where precision land forming was done. Farmers enthusiastically report more efficient machinery operations on formed land, especially after heavy rains. There are no low, wet spots to interfere with their cultivation.

Cotton field machines, especially pickers, work more efficiently in fields having a uniform crop. Tests at Newellton, La., in a field having a moderate ridge and slough conditions showed more even yields on the entire field after forming.

In periods of dry weather where irrigated fields have been formed, an increase of one-half to one bale of cotton per acre is reported. Increased yields of corn and reduced cultivation costs are reported on formed land by the Mississippi Experiment Station.

Farmers' acceptance of a practice is always a good index to its benefits. In most instances, farmers who have already formed land are planning to form additional areas. Most soil conservation districts in this area have from 5 to 30 applications ahead for land forming work. In many other instances farmers are hiring private engineers to lay out the work. They stress that their formed lands are so much easier to till and cultivate. Many say that this is sufficient benefit to proceed with the work, irrespective of the drainage and irrigation benefits.

In reviewing the land forming work we must realize that in a short period we have moved a very exacting, entirely new, agricultural practice to the humid section of the United States. Prior to the last 2 or 3 years, no great amount of land forming work was done in the cotton section of the alluvial areas. There was little information available on applying the practice to the humid area. Prior land forming work had been done for rice and sugarcane, both specialized crops, which use specialized field arrangements.

Agricultural workers, farmers, engineers,

and contractors are now going through a period of "growing pains" with the practice. They have done very well, considering their limited experience and available information. This is substantiated by the amount of land forming work that has been done in the short time since the farmers' acceptance of the practice.

There's an absence of large land levelers to correct the discrepancies left by the rough forming work. Since a .1-ft. tolerance is usually allowed on the rough land forming work, short land levelers are not bringing the areas to grade. As land levelers are new in the humid areas, farmers are not familiar with their use and limitations, and many still think of them as earth-moving tools instead of finishing tools. Furthermore, they are not familiar with the adjustments of the automatic type levelers. Equipment dealers have an obligation to familiarize farmers on the use, adjustment, and limitations of the equipment they sell.

The lack of skilled operators is a problem in doing the work, but this problem should be lessened as more experience is obtained.

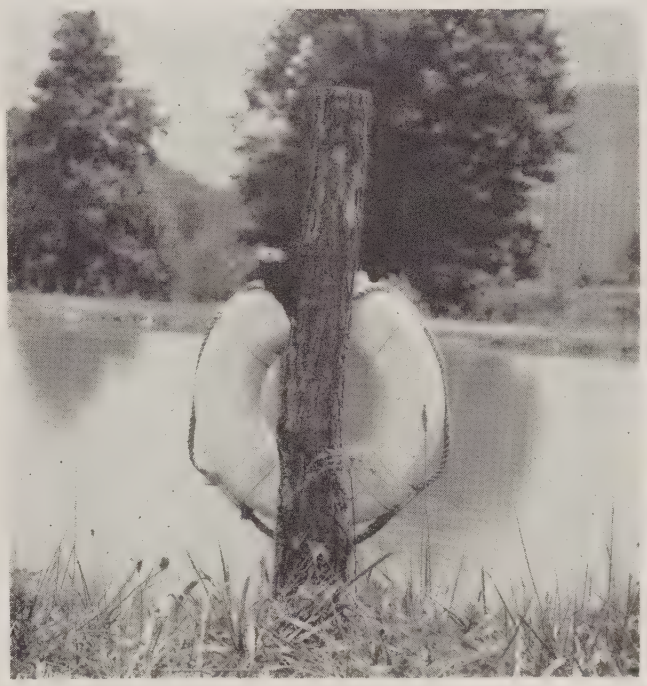
Additional research information is needed to carry on the work, especially on the following problems:

1. In the ridge and slough areas there is need for information concerning the maximum row length and grade that can be used with the minimum amount of eroson.
2. The maximum amount of sidefall that can be allowed in a graded area.
3. Information on faster runoff from formed land for adequate drainage design.
4. More definite information on the economical limits of land forming as related to benefits and the time for amortizing the costs.

Land forming work in the alluvial areas has made considerable progress in the last 2 or 3 years and all indications are that continued application of the practice will develop many refinements. As farmers, agricultural workers, engineers, and contractors obtain more experience with the practice, we can expect to see more precision in the work. With the vast farmers' acceptance of the practice, land forming should make a substantial contribution to the agriculture of the alluvial sections in facilitating drainage and irrigation and should be a definite aid to mechanized cotton production.

LIFE RINGS ADD SAFETY TO PONDS.—Two youngsters, carrying glass jars, were playing by the farm pond one spring day. They were hunting tadpoles. Neither could swim. As they walked by the water's edge, the older one shouted, "There's some!" He jumped in, stumbled and slid into deep water. The younger boy shouted "John!" But John gradually setttled under the water's surface. All this time the younger boy looked about frantically for something that would aid John. There was nothing. John was lost. Screaming in terror, he raced towards the house.

Such tragic scenes are happening in the United States all too often. In North Carolina alone, 21 persons drowned in ponds in 1956. Half of them were youngsters under 15. Forty percent of the accidental farm deaths of children under 10 were by drowning.



Life ring with rope attached is mounted on locust post near pond's edge.

That's why life saving rings are being recommended for ponds in western North Carolina's Haywood County Soil Conservation District. Supervisor Van C. Wells puts it this way. "In an emergency, the sight of a life ring helps a witness's brain function. Even a youngster will throw out a ring to someone who is drowning, practically without thinking."

In the Haywood District, life ring installations are now included as part of each farm pond design prepared by Soil Conservation Service technicians. All it takes is a standard marine life ring and 100 feet of one-half inch manila rope mounted on a post in a conspicuous place near the pond.

—Roy R. Beck

Furrow Irrigation In Alabama

Cotton Farmers of Eastern Alabama Find Surface Irrigation a Profitable Enterprise.

By A. A. SHEPPARD

SURFACE irrigation doubled cotton yields and tripled net profits last year for Ben Walker and R. L. Butler at Milstead in Macon County, Ala. As a result, 10 times as many acres in that community will receive extra water this year.

Irrigation projects underway in Lee, Elmore, and Tallapoosa Counties of the East Alabama and Piedmont Soil Conservation Districts may also be credited to Walker's pioneer project.

Walker had 22 acres under irrigation in 1957. He is now leveling 105 more acres, and within a few years he plans to be irrigating more than 300 acres. Englehart and Thompson are preparing 90 acres. O. G. Pinkston, Jr. will apply water to 15 acres this year and 50 acres next year. Others in the Milstead area are making plans for irrigating in 1959.

In Lee County, A. L. Lazenby, Jr. is building a pond for water supply and leveling 32 acres. The soil conservation districts also have applications for assistance in Elmore and Tallapoosa Counties.

Walker did not think he was gambling when he invested in irrigation a year ago. He does not think he and his neighbors are gambling now. And he cites research findings to prove his point.

"Even in this area of high rainfall we have regular dry periods that come when cotton needs water more than at any other time," he says. "We have plenty of water in streams and wells. All we have to do is put it on the land. And, we can do that much cheaper than in other sections of the country where irrigation is successful."

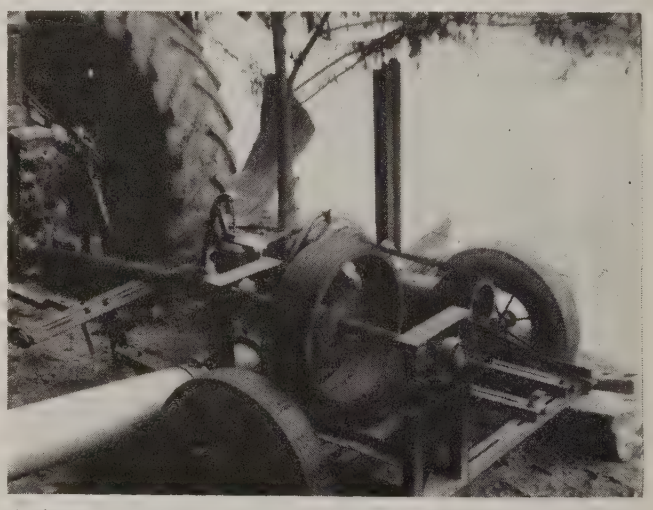
He cites the USDA's 1955 *Yearbook of Agriculture, WATER* to point out that cotton needs 22 inches of water during July, August, and September for top yields.

"That is two-thirds of all the water the crop will use during the whole year. Our dry season usually starts by the middle of July and runs through August, and often through September. Subsoil moisture doesn't help much, either," he says.

"The same book shows that cotton must get more than one-third of its water in the top foot of soil, and nearly two-thirds in the top 2 feet. So, during the dry 6-weeks to 2-month's period we lose half of our crop. I don't see any gamble in setting up a system to put water on cotton during the period when it needs more but normally gets less."

Walker thinks irrigation is more important to the little farms than to the big farms. With irrigation water on the 10- to 30-acre cotton allottments and some for a truck garden he contends the small farmers can stay in business.

Furrow irrigation is a new practice in Alabama and there is little experience in designing and operating the systems. Since that was true, the Alabama Experiment Station cooperated with Walker on his first project. Station em-



A farm tractor furnishes the power for a pump that lifts 2,600 gallons of water per minute from the Tallapoosa River to a storage reservoir.

Note:—The author is area conservationist, Soil Conservation Service, Dadesville, Ala.

ployees did this in order to apply research information obtained from experimental furrow-irrigation systems and also to gain additional information.

Evaluation of results obtained with Walker's pilot project showed that with proper design and efficiency, adequacy of irrigation can be obtained with furrow systems.

The field surveys, designs, and supervision of construction are done by the Soil Conservation Service. The Auburn Agricultural Engineers plan to continue their research to determine best methods of design and operation of the furrow-irrigation systems.

Water is stored in a small reservoir as it is pumped from the river.

County Agent, J. M. Bolling is also on the team and makes recommendations for specific cotton varieties, fertilizers, and insecticides to use.

Backing the program is the county ASC committee, which shares the cost of most projects. D. G. Johnson is chairman of the Macon County ASC committee, and is a member of the East Alabama Soil Conservation District Board.

SCS State office personnel are making studies of the types of land suited to surface irrigation

Siphon tubes are used to draw water from irrigation canal to cotton rows.

and designs that will give the best use of water.

"With this kind of help we are not likely to go far wrong," Walker adds. "We couldn't hire better help—but we don't have to—it is free. If we take advantage of it where we have suitable soils and water, we can keep our cotton industry in the Southeast."

Cotton on Walker's 22 acres of irrigated land produced 41 bales, even though bad weather during harvest time caused him to lose 5 to 10 bales. The grade was better and he was paid $5 to $10 more per bale than he received for cotton on land not irrigated. He says he would have made not more than 19 bales on the field if it had not been irrigated.

He likes this system of irrigation. Water is pumped from the Tallapoosa River into a small reservoir at the edge of the field. From this it flows through supply ditches and is siphoned out into the cotton middles.

In one respect it is better than either natural rainfall or sprinkler irrigation, he believes. He can spray the field for insects and immediately start irrigation. There is no waiting for the spray to kill the insects before the water is turned on. He can keep insecticide on the plants and the ground wet at the same time.

Walker contends that Alabama's average yield of lint cotton in 1957 was 346 pounds per acre, while Arizona, where cotton is irrigated, produced 1,097 pounds. Under irrigation he harvested 932 pounds and believes that if there had been no loss he would have equaled Arizona's production.

A Salute To District Supervisors

A Texas Editor Expresses His Views to the State Association of Soil Conservation District Supervisors of Arkansas.

By WALTER R. HUMPHREY

A State with enough on the ball to pass the first soil conservation districts law, doesn't need a foreign missionary to come tell it how to run its business.

In fact, I should be sitting at your feet to listen. For yours is the triumph of practical conservation, and your story is the saga of an awakened America.

Arkansas is a beautiful State. Without the constant effort of conservation-minded men and women, however, it could be a State pockmarked with the scars of waste and carelessness —its forests denuded, its hillsides white from erosion, its farmland gullied, its wealth in the channel of the Mississippi, and on the floor of the Gulf of Mexico.

What you and your fellow conservationists have done is to preserve a rich and productive heritage for those who follow you!

I come to you as a newspaperman who has seen the *Fifth horseman of the Apocalypse, "Erosion,"* met on the field of battle and contained.

I come as an editor who has been privileged to show the way of the soil and water-savers, to interpret their campaign, and to put conservation in the headlines as one of the great stories of my day.

It all was a dramatic story for me; a story unfolding before my eyes, a story I could tell with conviction because it impressed me from the very first day.

I saw in this great unfolding story the assurance that my home town would not be a ghost town or merely a footnote in history.

What has brought us to the threshold of a future in which hope has replaced the certainty of despair?

The vision and dedication of a prophet and crusader such as Hugh Bennett, the hand of the President of the United States, the devotion and salesmanship of the scientists who were assembled to lead the way, the State laws that permit us to organize districts.

Yet, the cooperative effort of neighbors was the payoff in the last analysis.

If neighbors hadn't gotten together to organize soil conservation districts; if they hadn't been convinced that they were in part responsible for what happened to the land that lay below theirs—well, if they hadn't been good neighbors, the miracle could never have happened.

There is no more essential unit of our free government than the soil conservation district and the supervisors who run it. Surely there are few public servants so unselfish and so dedicated.

"Supervisor" has become an honored title.

No scandal has been attached to it. No selfish purpose has corrupted it. Money can't buy it. It knows no party. It knows no favorite.

It is honorable and dignified and it exemplifies, more than any title I know, the good qualities of public service.

The supervisor is a man of the soil, but he is distinguished by his vision and his willingness to assume leadership.

He is a good citizen and a considerate neighbor. To him, conservation is a profession as well as a duty.

Neither the doctor nor the lawyer, the teacher nor the minister, surpasses him in the unselfishness of his devotion to the well-being of his community and the human race.

Yes, the supervisor is somebody very special. I salute the supervisor. He is the royalty of the conservationists, yet he bears his royalty with all the humility of the faithful servant.

Note:—The author is editor of The Fort Worth (Tex.) Press. This article is a digest of an address to the Arkansas Association of Soil Conservation District Supervisors. The complete address was published in the Southwest Implement News, Tex., April 1958.

Although I single out the supervisor for special mention, I fully recognize that he is part of a team; a team that must throw its forces together or we get no results at all.

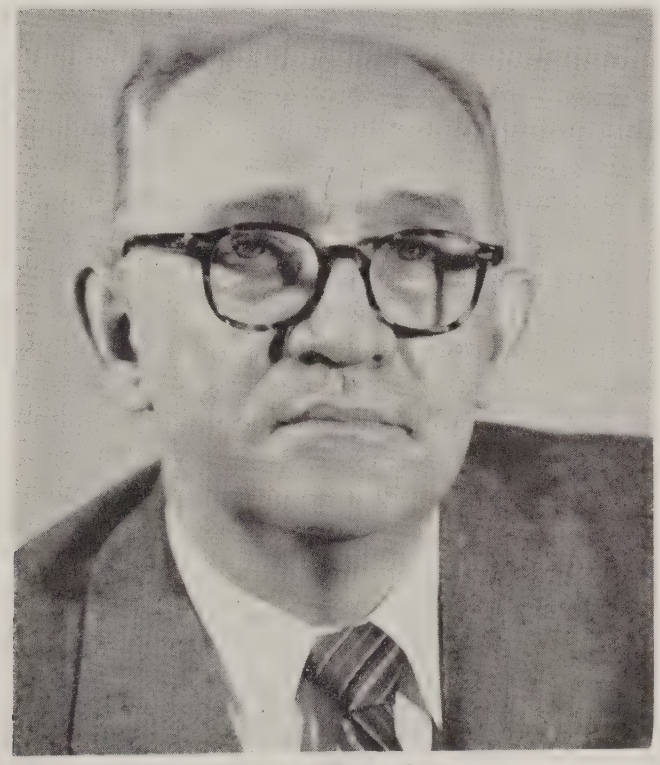
The army of those who are working every day at the assignment of saving the soil and water resources of Arkansas is a sizeable army.

Today it comprises nearly 70,000 cooperators. This adds up to strength in anybody's league. Add to that the other believers and you have a strong core of progressive citizenship committed to using beneficially all the water that falls from the clouds or comes rushing down from the mountains, and you are committed to letting no more of our good soil go washing or blowing away.

That isn't enough.

You who bear the burden of leadership know it isn't enough. You know that soil and water conservation should be taught in every schoolhouse.

You know that every banker, every merchant, every professional man must be completely persuaded not just that what you're doing is good, but that it's absolutely necessary. And that they must have a part in it.



Walter R. Humphrey

Conservation is a good word. People like it. It is politically acceptable. It sounds wholesome and it makes sense. Soil conservation makes sense, too, any way you take it.

But let us not ever be deceived into thinking that everybody understands and appreciates it. Everybody doesn't.

People have to be shown the simple, basic things. Why rainwater can be so destructive—what happens to tiny branches when torrents come roaring down them—how concrete walls can be undermined, but how deep roots can batten down the land. They have to be shown how grass and legumes work, and why a contour and a terrace are good.

All these are simple things that seem but ABCs to you and me. Yet, for the permanence of the task you have taken on your shoulders, you must teach these ABCs to the thousands of people who have neither heard them nor observed them. You must start with the children.

Education, therefore must be pursued with diligence. We cannot afford to relax until all of our people are conservationists.

As much as anything else, I am talking about the ideals of this problem, not about the scientific, practical aspects of it, and not about the economics of it. You know those things better than I.

It is the Golden Rule. It is being your brother's keeper. It is assuming a stewardship of the land. It is leaving a heritage to unborn generations. It is thrift. It is prudence. It is, in truth, a shining ideal.

What is conservation? It is simply the wise use of the land and of the water that falls on the land. It means minimizing the erosion by water or wind, planting crops that tie the land down on the one hand and restore its fertility on the other. Often it means *not* to plant. Primarily it means the application of good and sound rules of common sense.

Conservation is a sound and logical word. It connotes something we're all FOR.

I never saw an admitted anti-conservationist in my life. That's because folks like the idea. It's safe, progressive, non-political. It's like virtue, home, and motherhood.

Yet, I've seen many folks who actually were practicing anti-conservationists. So have you.

They're mostly the hear-no-evil, see no-evil

school. They haven't time for it. It's something remote and academic. Most of them live in the city. The bigger the city the worse they get. If you don't see the sunset across the plains, you see neither the field of waving wheat nor the dust storm.

We all live on and from the land and the protection and preservation of our natural resources can never be the sole responsibility of the man who happens to be the land's tenant.

So, whether I run a newspaper or a factory or a farm, whether I work in an office or a mill or on a ranch, these resources are in my charge. And I must do something to keep them productive for those who follow after me.

There is a great responsibility on the hearts of all of us to bring understanding of the problem of soil waste—to make the people we can influence acutely aware of the facts of life, namely: That the land feeds and clothes and sustains us, and if we're going to feed and clothe a people growing by 8 or 10 millions yearly, then we MUST use it wisely.

The alternative is a country growing poorer.

What can you and I do about it, specifically?

We can see to it that our children understand what erosion means and how important conservation is.

If we own or control any land or have influence with anyone who does, we can insist that a conservation program be followed.

We can offer our aid and comfort to our soil conservation district.

We can use our influence to see that sound and progressive soil conservation legislation prevails.

If we could but get over the lesson that the land is not just the farmer's worry, but that it is every citizen's concern.

That our cities and towns are completely dependent on the soil—their skyscrapers, their industries, everything they are or aspire to be.

That forests can be protected and harvested so as to insure a timber crop for all time to come.

That the very geography of sloping land means an obligation of a man to cooperate with his neighbor in controlling runoff and utilizing water.

That conservation is a philosophy of life, something to be believed in and lived because our lives depend on it.

That being a conservationist is being a good citizen, that ignoring our duty as caretakers of this exhaustible resource—is being a bad citizen.

Soil conservation isn't, in its final analysis, a scientific offensive—an assault by the skills and genius of technical men.

Soil conservation is people—people who love the land, people who will spend their fortunes and their lives to preserve the land, people who will fight to keep it green and fertile and useful and beautiful, just as a soldier will fight to keep it free.

SURPLUSES OR SHORTAGES?

IF there ever was a time when soil conservation was important, that time is now, Alexander Nunn, editor of *The Progressive Farmer*, told members of the Alabama Association of Soil Conservation Districts at their 15th annual meeting, in Montgomery, in January.

Basing his statement on, "the exploding world population and technology," Mr. Nunn pointed out that, in spite of present abundance, population is now outgrowing production and that "one of these days we're going to have shortages, not surpluses.

"We have grown from a population of 76 million to 171 million since 1900," he said. "It is now estimated that we'll have 225 to 230 million by 1975 and 300 million by 1993. Unless we can greatly increase production per acre, or unless we can uncover entirely new techniques of food production, we cannot always continue to provide the level of nutrition and the quality of production that we have today."

Mr. Nunn indicated too that there are factors in present surpluses that are not readily apparent. For example, the Nation has gained for other uses in recent years 30 million acres formerly devoted to production of feed for horses and mules. But, this is now over. There are less than 5 million horses and mules left altogether; yet, at the peak in 1918, we had 26,725,000.

"The exploding population in America is more than matched in other lands," he pointed out. "It is predicted that the present world population of 2¾ billion will increase to 6 billion by the year 2000 and to 13 billion by the year 2100."

"Because of what American farmers have achieved in efficiency," he said, "no large group of people has ever had so much good food, at such a high level of nutrition, and at such a low percentage of their income as have the people of this Nation. And the ridiculous part of it—if it were not so dangerous and likely to be so tragic—is that the more abundant has been the farmer's production, the less money he has received for it.

"In recent years," he continued, "the income of every other major group has gone up while that of the farmer has gone down. Yet, the farmer has been increasing his efficiency faster than other groups.

"Orris Wells, chief USDA economist, tells us today that a 10 percent increase in production in agriculture for the Nation brings a 16⅔ percent cut in price; a 10 percent cut in overall production brings a one-sixth increase in price.

"In other words, for the short term, it would pay farm people to produce less than normal crops. They would actually make more. None of us, I think, would say that this policy is sound for the individual farm family or for the Nation over a long period of years. But we must stop penalizing our farmers for abundance.

"Furthermore," he pointed out, "while national population is growing so fast, farm population has been rapidly dropping. At the peak, we had about 32 million farm people in 1930; today, with a much greater total population, we have less than 21 million farm people.

"The qualities that have built America have come from living close to the soil and to nature. We cannot save democracy or the system of private enterprise of which we've been so justly proud in a highly urbanized society. We must continue to push soil conservation and policies that will insure a stable and prospering agriculture. Soil conservation is everybody's job—the individual's and the Nation's.

"You, working together unselfishly in soil conservation districts, have helped to put a spiritual quality into agriculture, a spirit of teamwork and cooperation that we so badly need today," he told the group. "You have been training real farm leaders.

"For the future, I suggest consideration of a policy which says in essence, 'It may be that we can best save our own generation by saving others.' The self-centered have always lost."

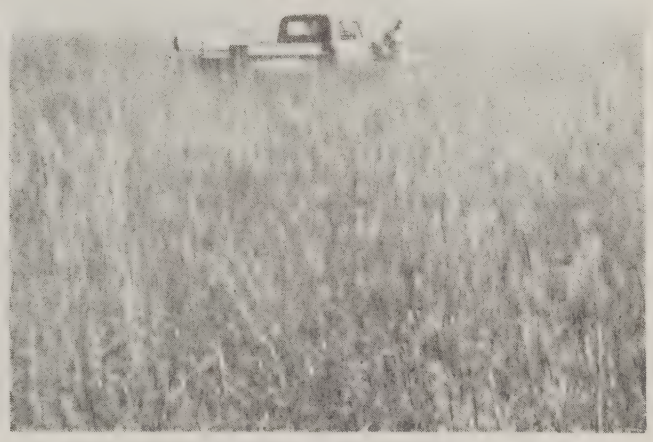
A Bountiful Harvest

More than 400,000 Pounds of Native Grass Seed were Harvested in One Kansas Community During the Fall of 1957.

By GUY MOOREFIELD

A TRAVELLER going north out of Rosalia, Kans., in the fall of 1957, found himself comparing the amazing sight then confronting him with that of just a short year before. In every pasture the tall bluestem plants were waving seed heads like seas of ripening wheat. Self-propelled combines hummed their way over practically every hillside. The combines rolled from hill to vale gleaning the rich harvest of

Note:—The author is work unit conservationist, Soil Conservation Service, El Dorado, Kans.



A seed crop of bluestem grass ready for harvest on the C. R. Nuttle ranch.

prairie grass seed. From Kansas, Oklahoma, Colorado, New Mexico, and Texas commercial seed dealers had converged on this area to harvest bluestem seed.

Many natives were amazed. Harvesting of prairie grass seed on such a scale was unheard of. It was a time race between Nature's own combine of high winds and freezing weather against the reapers driven by man. Seed had to be binned while favorable weather lasted.

One year ago, this area was seared after a 5-year period of unprecedented drought and hot winds. The grasses were short and many pastures were virtually grazed to the ground. Many cattlemen were forced to truck in feed and water for livestock. Some cattle herds were greatly reduced and no longer were herds shipped in to graze the famous bluestem grasses.

But in the spring of 1957, the rains came again and so did the grasses. The 1957 stocking rate on most of the pastures had either greatly reduced grazing or had deferred grazing practices because of the short condition of the grasses. This proved to be wise range management, as it allowed the grasses to get a good start with the rains. Their recoverey was almost unbelievable. By midsummer they were ahead of the cattle in many pastures. The grass kings of the prairie—big bluestem, little bluestem, switchgrass, and Indiangrass—were acquiring their typical reddish color and sending up seed stalks.

Soil Conservation Service personnel were watching the developments. The big question was would the seed heads fill. News articles were written informing local ranchers of the seed possibilities, and how to analyze their seed prospects. In September, young Dave Nuttle came into the El Dorado SCS office and requested that the C. R. Nuttle Ranch pastures be inspected. The author and young Nuttle drove to the pastures.

The prairie grasses resembled in height and density a fine wheat field at harvest time. Subsequently other pastures were inspected. The A. H. Gish pastures showed fine possibilities for switchgrass production. The Vestring, Smith, and Liggett pastures were seas of waving grass. By October the seed heads had filled. Hundreds, even thousands of acres stood ready to be harvested. Ranchers were urged to make arrangements to harvest the much needed seed.

Soon the news spread to commercial seed dealers over the Great Plains. Representatives converged upon the area. Quickly they spread out, entered into contracts with the landowners to harvest the seed—giving either a share or cash. Dealers wanted prairie grass seed.

With contracts made, combines began moving in. Local machines and operators were hired

Combine harvesting native grass seed on the A. H. Gish ranch.

Blackwell switchgrass on the Winston Wheeler ranch that yielded more than 400 pounds of seed per acre.

in many cases. Abandoned schoolhouses, store buildings, and every other available empty building of adequate size were rented in which to store and dry the seed.

The first combines began October 12, on the A. H. Gish Ranch, 6 miles north of Rosalia. Over 70,000 pounds of switchgrass seed were harvested on the Gish Ranch. Before the combines were halted, by a combination of freezing weather and strong winds, approximately 400,000 pounds of prairie grass seed had been harvested in the Rosalia area. The seed came primarily from the Gish, Nuttle, Smith, Vestring and Liggett pastures.

Many hundreds of acres were not harvested because of inclement weather. However, a good harvest was made and the much needed seed is now available. In Butler County, the SCS estimates that 26,000 acres of eroded cropland should be reseeded to native prairie grasses. At 15 pounds per acre, it would require 390,000 pounds of seed to plant this acreage. The seed harvested would just about do this reseeding job. But much of this seed crop will not be used in Butler County, it will be shipped to other areas needing prairie grass seed. Yet, the Butler County Soil Conservation District grassland drill was busy in late winter and early spring of 1958 drilling prairie grass seed.

The Bull-Tongue Plow Comes Back

Farmers in the Hills of Tennessee Use the Bull-Tongue Plow and One-Row Corn Planters to Seed Grass on Steep, Shallow Soils.

By BILLY F. SMITH

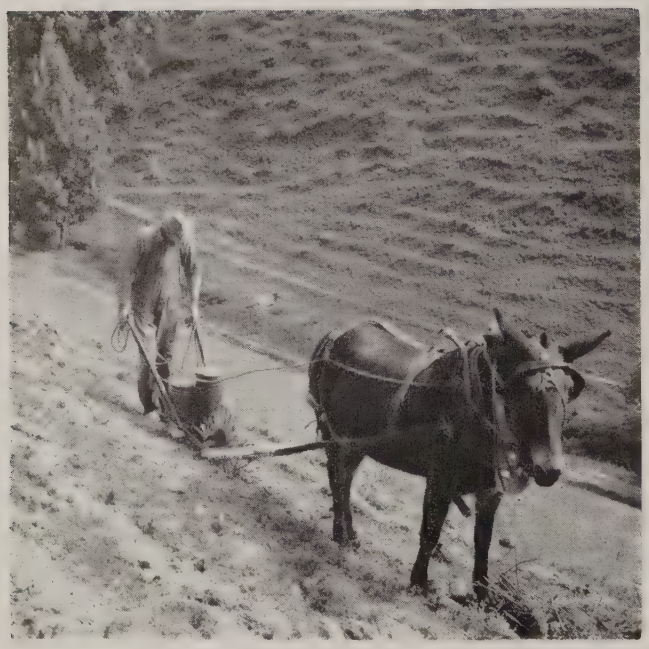
"THE man with the bull-tongue plow" can be seen again in the hills of eastern Tennessee. This time he is not planting cultivated crops as did his forefathers. He is planting grass to prevent soil erosion and provide grazing.

Making a living on steep hills with shallow and droughty shale soils is not easy. But farmers in the Cocke County Soil Conservation District have found a way to grow badly needed pastures. They seed Kentucky 31 fescue in contour rows, using a bull-tongue plow and a one-row corn planter.

While Cocke County has much good bottom land on the Pigeon, French Broad, and Nolichucky Rivers, it has its share of steep shale, mostly in the Dandridge soil series. The slopes range from 15 to 60 percent—too steep for tractor-drawn farm equipment.

Note:—The author is work unit conservationist, Soil Conservation Service, Newport, Tenn.

Howard Parks and son Johnny display equipment used in seeding grass on a steep hillside.



Planting tall fescue with a one-row corn planter on the Raymond Jenkins farm.

Conservationists who are acquainted with the area generally agree that to set pine seedlings on these soils would probably be the best long-time solution. But, many farmers are faced with the problem of making a living on farms that have as much as 90 percent or more of these soils types. Typical of these farmers are W. Gray O'Neil and Howard Parks of Newport, Tenn.

Mr. O'Neil owns more than 500 acres of land, 80 percent of which is Dandridge soil. He grows needed hay and grain on another farm. He is pasturing about 100 Angus cattle and 70 ewes on the hill farm. He asserts that he could not maintain his farm economy by setting 80 percent of his land to trees.

Mr. Parks' farm consists of 75 acres, 90 percent of which has steep shaly soil. He runs a dairy. He, too, cannot see how he can make a living with 90 percent of his land in trees.

So with the need for pasture an economic necessity, these farmers have set out to answer the following questions: What grasses and legumes are best suited to these soils? What is the best method to establish pasture on this land that is too steep for ordinary machinery?

Parks and I began to work on these questions while developing a farm conservation plan for the Parks' farm in July 1956. Looking around the farm for some answers, we noticed an old bull-tongue plow and a one-row corn drill, which is still used there to plant corn and other row crops. With some adjustments it was decided to try them on the hills to seed Kentucky 31 fescue.

The bull-tongue was used to open furrows 6 inches deep and 1½ to 2 feet apart on the contour. The corn planter fertilizer attachment was used to drill 400 pounds of 6-12-12 fertilizer per acre in the furrows. The grain planter on the drill was set to its maximum speed. The spout was removed at the base of the seed box to allow the fescue seed to flow uniformly on or near the surface of the soil. Upon examination the seed were found to be about one-fourth to one-half inch deep and the fertilizer about 2 inches deep.

The Parks' seeding was completed in August 1956. Later in the fall three or four of his neighbors tried variations of this method on their farms. By the spring of 1957 there was a good growth on all the row seedings.

Gray O'Neil seeded 30 acres by this method in February and March 1957. He too was successful. Records of the O'Neil operation show that total cost of seeding this way, including labor, seed, and fertilizer was $14 an acre. This is about one-half the cost of preparing a seedbed and seeding by conventional methods.

Kentucky 31 fescue was used on all farms. Mr. O'Neil said, "I have found Kentucky 31 fescue to be the best grass for these droughty

Inspecting a one-year old seeding of tall fescue on the Howard Parks' farm.

thin soils." Legumes used on the O'Neil farm include sericea, annual lespedezas, and white clover. Mr. Parks plans to overseed clover or annual lespedeza on his row seedings of fescue.

All the farmers using this method have been pleased with the results; and, so far the plantings have been successful. Results of this method are similar to those reported by experiment stations where band seeding (a method of precision placement of seed and fertilizer) equipment has been used. Recent research indicates that seed placed one-fourth inch deep and fertilizer placed about 2 inches deep gives faster initial growth and more surviving plants per acre. Other advantages include less weed competition and more forage per acre. Seeded grass also has a better chance to compete with other existing vegetation because the fertilizer is placed in a band directly beneath the desired grass.

So, until mechanized equipment is developed for precision placement of seed and fertilizer on these very steep hills, there is still a need for "Old Beck" the mule on many of these farms. Soil and water onservation can still be achieved with mule power as well as with tractor power.

More Fences to Cross

By T. S. BUIE

ERON CROW is a soil scientist stationed at Bamberg, S. C., and as other soil scientists, when he starts out to make a soil survey of a farm or similar area he doesn't let ditches, fences, or any other obstruction get in his way.

Recently, in talking about the agricultural developments, which have occurred in Bamberg and adjacent counties since he began work there 15 years ago, Crow said: "I know that the land use pattern in this section of the State has changed greatly in the last 10 or 12 years. When I first came here, I rarely ever had to climb over or crawl through more than 3 or 4 fences in a day; now, the number has increased to 25 or more. Most of them are cattle fences, too."

This illustrates better than mere figures how farmers have changed from growing cotton and other row crops in unfenced fields to livestock. Sleek herds of beef and dairy cattle can be seen on almost every farm and when they are not grazing on luscious grass pastures enclosed by strong fences they are lying in the shade of trees placidly chewing their cuds.

Farmers in the Edisto Soil Conservation District have established 10,362 acres of permanent pasture since the district was organized in 1937. During the same period the cotton acreage has been reduced from more than 20,000 to about 8,000 acres.

Note:—The author is State Conservationist, Soil Conservation Service, Columbia, S. C.

Eron Crow crosses another fence during his soil survey operations.

IN ORDER TO INSURE VALUE RECEIVED for the farmer's and government's dollar, technical soundness in conservation planning and treatment is essential. Whether it is under district farm planning, cost-sharing programs, or watershed land treatment, the conservation measures should fit the needs of the land and the conservation objectives of the farmer.

D. A. WILLIAMS

Stubble-Mulch Fallow

Stubble-Mulch Fallow Controls Wind Erosion and Stabilizes Crop Yields for Nebraska Wheat Farmers.

By EUGENE E. SOLOMON

A GROUP of wheat farmers in Scotts Bluff County, Nebr., are doing an outstanding job of stubble mulching on land subject to severe wind erosion. They have found that the stubble-mulch fallow system of farming pays off in better crops, especially during years when wind erosion is severe.

Robert Preston, a cooperator with the Scotts Bluff Soil Conservation District, was one of the first to start this method of farming in the Lyman area. Preston does his stubble mulching mainly with sweep equipment. After extensive study and traveling, as far as Canada to see how stubble mulching was done elsewhere, Preston has relied mainly on large sweep equipment to do the job. Occasionally one-ways and rod weeders are used in combination with sweeps.

Preston and most other farmers in the area make two tillage operations after harvest. These operations are made for the control of volunteer wheat and cheatgrass, or downy brome as it is sometimes called. Because cheatgrass and winter wheat are much alike in growth, farmers find the cheatgrass difficult to control. The first sweep operation is made in the stubble field immediately after harvest to plant the seed of cheatgrass. This operation is followed by a second operation with sweeps in fall to kill the cheatgrass planted by the first operation. Usually three or four operations are made during the fallow season the next year. It sometimes is necessary to use the one-way on the first spring tillage operation when wet conditions occur in the spring. Ordinarily the ground can be tilled a few days earlier with the one-way than with sweeps.

Some of the farmers in the Lyman area delay all tillage operations until spring. But, most

Note:—The author is management agronomist, Soil Conservation Service, Scotts Bluff, Nebr.

Planting wheat with a high clearance drill in heavy stubble mulch near Lyman, Nebr.

Wheat growing in a stubble mulch field near Lyman, Nebr.

agree that timeliness in making sweep operations is very important for the control of weeds and maintenance of residue.

Drilling is done with high clearance hoe drills. These drills have about 17 inches of clearance between tip of the hoe and the frame of the machine. There are about 24 inches between front and rear ranks of hoes. Drill rows are spaced from 10 to 14 inches. These high clearance drills make it possible to pass through heavy residue and at the same time keep from covering the mulch.

The fallow system performed by the Lyman farmers is done in such a way as to maintain enough residue on the surface to protect the land from blowing at all times. Usually this is about 1,500 pounds per acre at drilling time. Mr. Preston states, "Maintenance of residue and the control of weeds, especially cheatgrass, takes closer management on our part, however, it is necessary to control wind and water erosion and stablize crop production."

DISTRICT PROFILE

JESUSA APONTE of PUERTO RICO

FOR the first time since soil conservation districts were organized in Puerto Rico, a woman, Mrs. Jesusa Aponte, has been elected supervisor of one of the 17 soil conservation districts into which Puerto Rico is organized.

Mrs. Aponte personally supervises and operates a 272-acre sugarcane, coffee, and livestock farm located near San Sebastian in the upland part of central-western Puerto Rico.

Mrs. Aponte's efforts in the cause of soil and water conservation were recently given recognition by the Puerto Rico chapter of the Women of America, when she was selected as one of the outstanding women of the year for her successful contribution to the betterment of the land and the people of Puerto Rico.

Soon after taking over operation of the family farm, Doña Susin, as she is known to all her neighbors, proceeded to plant locally adapted and higher yielding sugarcane varieties. She removed old low-producing coffee trees, substituting for them seedlings from her own tree nursery of Puerto Rico Select and Bourbon varieties.

Mrs. Jesusa Aponte.

She has planted the Bourbon variety without shade. Tests show it is capable of producing 2,000 pounds of shelled coffee per acre. This compares very favorably with a 150-pound yield obtained from the former overcrowded and highly shaded inferior plants.

All new sugarcane plantings have been made on the contour. This, together with the crop residue mulch obtained from the sugarcane leaves, provides excellent protection against soil erosion. She has replanted 75 acres of low-yielding, native pasture to high-yielding pangolagrass.

In addition to her multiple farm responsibilities, Mrs. Aponte has reared three daughters, the youngest of whom is now finishing college in Washington, D. C.

Mrs. Aponte's enthusiasm for and interest in soil and water conservation induced her to become a candidate in last year's election for district supervisors. In spite of the fact that no other woman had ever before been considered for such a position in Puerto Rico, she was elected by a large majority. Since then her leadership and enthusiasm have made her well known throughout Puerto Rico.

At present, she is chairwoman of the Culebrinas Soil Conservation District board. This district is one of the most active in the Caribbean Area.

Through her leadership the district has sponsored the production of seeds from improved grasses and legumes: such grasses as napier, molasses, and pangola, as well as the tropical kudzu legume. The seed produced has been distributed on a loan basis (each agrees to return an equal amount when his plantings reach seeding age), among more than 75 interested district cooperators.

The Culebrinas Soil Conservation District board of supervisors has also encouraged 30 coffee farmers to prepare their own coffee tree nurseries using improved varieties. Furthermore, it has called to the attention of the farmers in the district the need for diversifying crops and planting crops such as onions, corn, and vegetables, which are not grown in sufficient amount, at present, in Puerto Rico.

It is a tribute to her unselfish interest in the cause of soil and water conservation that Mrs. Aponte refused to be considered for any elective post in the Puerto Rico Association of Soil Conservation Districts last year. She preferred to serve as a representative of her district on the board of directors, allowing others, with greater experience in administrative procedures, to lead the destiny of the State association for 1958.

Mrs. Aponte's example in soil conservation district leadership may well serve as an incentive to other women of Puerto Rico to take a more active part in the conservation of the Commonwealth's natural resources.

—J. F. MARRERO

Prairie Windbreaks

By SIDNEY S. BURTON

COMFORT is desired by everyone during the winter months. A good windbreak can help give this comfort and at the same time be profitable.

As a nursery salesman once said: "I could sell a billion trees during January and February if there was some way to put them into the ground." But when the bitter winter winds stop whistling down the chimney, and there is no longer snow to be shoveled between the house and barn, the need for protection is forgotten in the rush of spring work.

Trees are not just mighty nice, they also have actual dollars and cents value on most farms.

A good farmstead windbreak, by actual measurement, has reduced winter fuel costs by as much as $50. Feed costs of 86 South Dakota and Nebraska cattle feeders were reduced by an average of $800 annually because of the protection from windbreaks. Fifty-three dairy farmers estimated their savings at $600 a year.

Protecting the farmyard with a windbreak not only saves snow shoveling in the winter, but also makes it easy to beautify the home with lawns, ornamental shrubbery, and flowers.

To obtain these benefits, advanced planning is important. The ground should be made ready for planting a year ahead. Trees should be ordered early in the fall for spring delivery. Whether a new windbreak is needed or an old planting is to be reinforced, the planning should carefully consider the kinds of trees that will make the best barrier to the wind.

Most farmsteads have been planted to trees over the years, but many still do not have efficient windbreaks. These old tree plots can often be converted to good windbreaks by the judicious use of shrubs or conifers, as many Nebraska farmers have proved.

Note:—The author is woodland conservationist, Soil Conservation Service, Lincoln, Nebr.

Snow drifts near a Holt County, Nebr. farmstead that lacked windbreak protection.

An earlier planting of elm trees is reinforced by three rows of red cedars to make an effective windbreak in Colfax County, Nebr.

Two-year old multiflora rose and red cedar are holding snow that used to blow through this Antelope County, Nebr. windbreak.

Cultivating a young windbreak planting on the Harvey Raynard farm in Logan County, Nebr.

Farmstead windbreaks on a York County, Nebr. farm.

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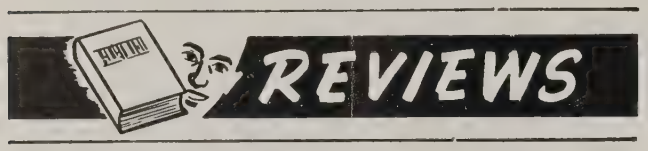

DUST BOWL. By Patricia Lauber. 96 pp. Illustrated. 1958. New York: Coward-McCann, Inc. $2.50.

THIS is one of the "Challenge Books" put out by the publishers for children in the intermediate grades. It is well written and profusely illustrated. It includes a brief history of the Great Plains with emphasis on the droughts of the 1930's and 1950's. The latter part of the book is devoted to conservation measures that may prevent future dust bowls.

MATERIALS FOR TEACHING CONSERVATION AND RESOURCE-USE. By National Association of Biology Teachers. 55 pp. Illustrated. 1958. Danville: Interstate Printers and Publishers, 35¢.

THIS bulletin should be an excellent reference for teachers and others doing conservation education work. It includes listings of free and inexpensive materials from State and National agencies, selected references, films and film strips, and other teaching aids.

WATERSHED PROTECTION.—The small watershed program under Public Law 566 is one of the great conservation developments of our time. It is of, for, and by the local people. It is fashioned in the traditional American concept that the people themselves not only have the right but the responsibility to develop and carry out their own programs.

EZRA TAFT BENSON,
Secretary of Agriculture

GOOD NEIGHBORS.—Howard Gilmore of Westboro, Mass., wanted to enlarge his 1½-acre pond to 2½ acres. That would have meant, though, placing the spoil on the farm of his adjoining neighbor, Francis Adams. Gilmore and Adams were both cooperators of the Northeast Worcester County Soil Conservation District. So it was natural that both men were used to working helpfully with people. Here was a case where each could help the other to his own advantage.

So Gilmore bought a 400- by 100-ft chunk of Adam's land. That let him enlarge his pond. To help his neighbor, Gilmore extended the pond into Adam's farm. Now Adams can also use the pond to water his livestock.

—GAYLAND E. FOLLEY

MINIMUM TILLAGE.—Wisconsin soil specialists have found that rough plowing, wheel track planting of corn, and interseeding of alfalfa between the corn rows is a practical method of renovating old pastures or meadows. Their tests were made on a 12-year-old bluegrass pasture with a 12 percent slope. The plowing and corn planting were done on the same day. Weeds in the corn were controlled by a 2-4-D ester at planting time. The alfalfa was interseeded a month later.

Even with a heavy rain the day after corn planting, no runoff or soil loss occurred on the rough plowed land and the corn germinated almost 100 percent. The alfalfa stand was better between the 60-inch corn rows than between the 40-inch rows, but the corn yields were about 10 bushels lower. The average yields on all plots was about 80 bushels of corn per acre.

CONSERVATION EDUCATION CONFERENCE.—The fifth annual conference of the Conservation Education Association will be held at the University of Utah, Salt Lake City, Aug. 18–21, 1958. Participants will include educators from all teaching and administrative levels, leaders of youth groups, and representatives of industries and private agencies concerned with conservation of natural resources. The theme of the conference will be: "Conservation Education at the Grass Roots—How Can We Do It Better."

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